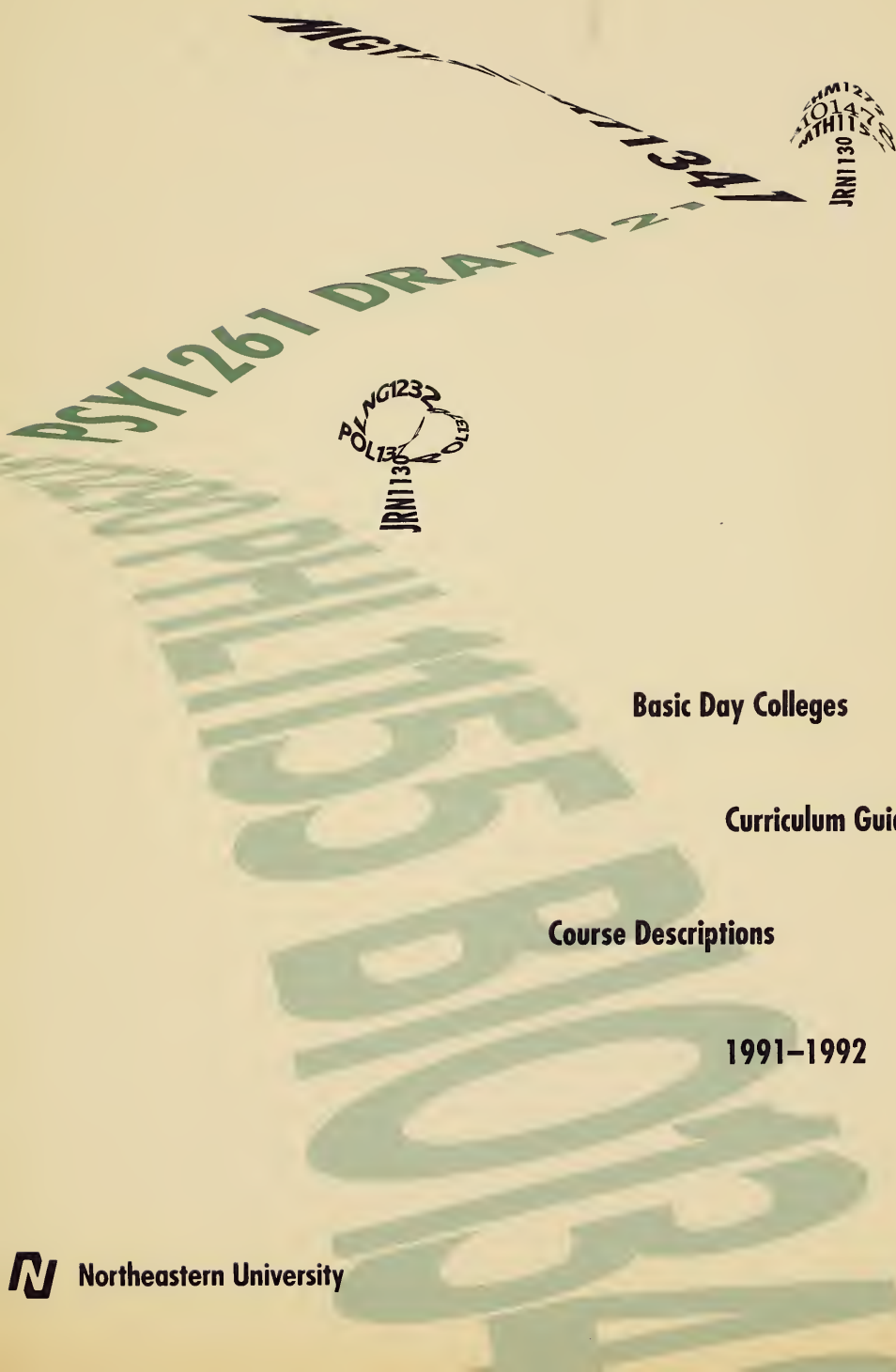


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Basic Day Colleges

Curriculum Guide and

Course Descriptions

1991–1992

Northeastern University

**Basic Day Colleges
Curriculum Guide and
Course Descriptions**

1991–1992

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Curriculum Guide 1991–1992

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Appendix

Curriculum Guide

About Specimen Programs

The following specimen programs are for general informational purposes only. Specific information on course requirements, elective course distribution, and achievement levels vary from program to program, and even class to class. Consult with your academic advising office, listed below, to make certain you have all the necessary resources before planning your own curriculum.

Alternative Freshman Year	249 Ryder
Boston-Bouvé College of Human Development Professions	100 Dockser
College of Arts and Sciences	
African-American Studies	132 Nightingale
Anthropology/Sociology	501 Holmes
Art and Architecture	239 Ryder
Biology	414 Mugar
Chemistry	102 Hurtig
Economics	301 Lake
English	406 Holmes
Geology	14 Holmes
History	249 Meserve
Journalism	102 Lake
Linguistics	565 Holmes
Mathematics	567 Lake
Modern Languages	360 Holmes
Music	351 Ryder
Philosophy and Religion	103 Meserve
Physics	111 Dana
Political Science	303 Meserve
Psychology	125 Nightingale
Speech Communications	147 Meserve
Theatre	337 Ryder
College of Business Administration	205 Hayden
College of Computer Science	161 Cullinane
College of Criminal Justice	400 Churchill
College of Engineering	220 Snell
College of Nursing	102 Robinson
College of Pharmacy and Allied Health	206 Mugar
School of Engineering Technology	120 Snell

Special Note

Classes at Northeastern University are scheduled in different modules.

In assessing quarter weights for courses, the following statement applies: *One quarter-hour of credit is equal to 50 minutes of instruction per week, plus two hours of preparation.*

The Scheduling Office, 126 Hayden Hall, maintains all quarter-hour weights for courses. In the event of error in any publication, the academic record will reflect the correct quarter-hours applicable to any degree requirement.

Some course titles may change, but the course number remains the same. Be sure you do not register for a course you may have already taken.

College of Arts and Sciences

The College of Arts and Sciences offers degree programs in twenty-two majors. In most majors, two degrees are offered: the bachelor of arts and the bachelor of science. Requirements specified by the department offering each major are listed on the following pages. In addition to the requirements specified by the department, the college has established certain minimum graduation requirements for students.

Quantitative. Candidates for either the bachelor of arts or bachelor of science degree must successfully complete 176 QH credits. In addition, only 4 QH of physical education and no ROTC credits may be used to meet this requirement.

Residency. Candidates must complete either 75 percent of the degree credit (132 QH) or the last three full quarters (a minimum of 12 four-credit courses) in the Northeastern University Basic Day Colleges.

Qualitative. Candidates must achieve a minimum cumulative average of 2.0 (grade of C).

The Core Curriculum

The College of Arts and Sciences core curriculum is required of all students.

The core curriculum is a set of requirements intended to provide students with the opportunity to gain the broad base of knowledge traditionally associated with a liberal arts education. The core gives students the opportunity to develop proficiency in basic skills; to be exposed to methods of analysis in the various subjects and disciplines in the arts and humanities, the social sciences, and the natural sciences and mathematics; and to become acquainted with ideas in Western culture, differing views in non-Western cultures, and major issues and problems facing contemporary society.

The core curriculum consists of six categories.

Category I Basic Skills

- Freshman English (two or three courses)
- College mathematics
- Modern language through Intermediate 2 level (required of all BA candidates)

Note: For placement information on freshman English, college mathematics, or modern languages, students should consult the Office of the Dean, 400 Meserve Hall, or the appropriate department. Placement criteria are published in *The College of Arts and Sciences Guidebook*.

Students who plan to use Russian or Italian language study to satisfy the foreign language requirement should begin their program early

because the college is not always able to offer these courses on a regular basis.

Category II Methods of Inquiry

Category III The Western Cultural Heritage

Category IV Alternative Cultures and Societies

Category V Theoretical Perspectives and Changes

Category VI Current Issues in Perspective

Note: Descriptions for all College of Arts and Sciences courses begin on page 79. Courses approved for the College's core curriculum have Roman numerals in parentheses at the end of the descriptions. Roman numerals indicate the appropriate core curriculum categories for each core course. Students are required to complete courses in each category of the core, depending upon the major and degree pursued. *The College of Arts and Sciences Guidebook*, available in the Office of the Dean, 400 Meserve Hall, provides a thorough description of the courses required in each category, as well as a list of courses that may be used to fulfill each requirement.

Middler Year Writing Requirement

The middler year writing requirement may not be fulfilled until the student has successfully completed at least 80 QH credits (including transfer credit) and should preferably be completed before 144 QH credits. The requirement must be fulfilled at Northeastern. The College of Arts and Sciences strongly recommends intermediate writing (ENG 1350) to complete the MYWR. Students may, however, also satisfy the requirement by completing a four-credit writing course from the approved MYWR list with a grade of C or better or, with special permission through the petition process, a one-credit writing workshop (ENG 1340). Students not participating in the cooperative education program complete the MYWR in their junior year.

College Honors Program

The College of Arts and Sciences Honors Program is part of the University Honors Program that runs honors sections for selected required or elective courses, as well as interdisciplinary honors seminars. Honors and standard sections of courses are usually equivalent in terms of satisfying degree requirements and are distinguished by course number. For example, the honors section of ECN 1115 is ECN 1715; for PHL 1100 it is PHL 1700. An updated list of offerings is available in the Honors Program Office and also appears in the registrar's course listings.

There are two types of honors courses. *Honors within a standard course* are activity courses that

allow students to substitute special work for some of the standard assignments within the course. *Honors outside a standard course* are adjunct courses that carry an additional 1 QH credit so that students receive two grades: one in the standard course and one in the honors adjunct. This 1 QH course can only be taken with another standard course and represents the enriched work that makes the entire 5 QH honors course. Activity and adjunct courses only appear on the listing in the Honors Program Office. Because they do not carry separate numbers, activity and adjunct courses do not appear as honors-level in the registrar's course listings.

For more information on honors courses, how to qualify to take courses, and other aspects of the program, contact the Honors Program Office at 617-437-2333 or drop by 215 Lake Hall.

Students should refer to *The College of Arts and Sciences Guidebook* and any publications distributed by major departments for more specific information about the curriculum.

African-American Studies

Bachelor of Arts Bachelor of Science

A major in African-American studies offers background for a range of professions calling for understanding of intergroup relations and the minority experience. Students may go on to graduate study in such areas as social work, sociology, education, law, business, history, or the humanities.

Students majoring in African-American studies may earn either the bachelor of arts (BA) or bachelor of science (BS) degree. All majors are required to take the following set of courses.

AFR 1127 African-American Literature 1
AFR 1131 African-American History 1
AFR 1161 Economic Issues in Minority Communities
AFR 1171 Survey of Contemporary Black Political Movements
AFR 1240 Contemporary Issues in Black Society
AFR 1248 Race Relations in America
AFR 1280 Black Psychological Identity
AFR 1300 Directed Study
AFR 1350 Research Seminar

In addition, complete the arts and sciences core curriculum (see page 3).

Faculty advisers work with students to help them select one or more "concentration clusters" (as described below) in African-American studies.

Minor in African-American Studies

A minor in African-American studies is designed to meet the needs of students who major in other areas but have a special interest in African-American studies. To qualify for a minor,

a student must earn 28 QH credits in the field, 12 of which must be from the set of courses required for majors. The remaining credits will be a concentration cluster arranged in consultation with a student's faculty adviser.

A concentration cluster is a set of four courses that focuses on an aspect of African-American studies. A cluster might focus on sociology-psychology, history, humanities, human service, research, or other areas related to the student's educational or career needs. Concentration clusters are arranged in consultations between the student and a faculty adviser.

Art and Architecture

Bachelor of Arts Bachelor of Science

Major in art. ART 1100, History of Art to 1400, and ART 1101, History of Art since 1400; ART 1124, Basic Drawing; ART 1130, Visual Studies Foundation 1; ART 1131, Visual Studies Foundation 2; and twelve art electives.

In addition, complete the arts and sciences core curriculum (see page 3).

Architecture concentration. Leading to a BS degree that is not a professional degree in architecture. Same requirements as for the art major, except for the twelve art electives that are replaced by four architectural history courses (ART 1111, Introduction to Architecture; ART 1203, Medieval Architecture or ART 1204, Renaissance Architecture; ART 1225, Modern Architecture 1 and ART 1228, Modern Architecture 2); five architectural studio courses (Architectural Design 1 to 4 and Architectural Thesis 1); three building technology courses; and four math/science courses (MTH 1123, Calculus 1; MTH 1124, Calculus 2; PHY 1221, Physics for Engineering Students 1; PHY 1222, Physics for Engineering Students 2). To fulfill all requirements for the architecture concentration, students must begin required courses in the first year.

In addition, complete the arts and sciences core curriculum (see page 3).

Visual and media design concentration. Same requirements as for the art major, except for the twelve art electives that are replaced by: ART 1132, Principles of Graphics; ART 1134, Typography; ART 1160, Introduction to Photography; ART 1180, Video Basics; ART 1190, Introduction to Computer Graphics; ART 1213, Modern Painting; ART 1240, History of Graphic Design; ART 1241, Advertising Design; ART 1243, Graphic Design 2; ART 1250, Color Theory and Practice; ART 1254, Intermediate Drawing; ART 1263, Introduction to Color Photography; ART 1280, Media Graphics; ART 1290, Electronic Publishing Design; ART 1291, Intermediate Computer Graphics Workshop; ART 1330, Advanced Visual Communica-

tion; SPC 1300, Introduction to Communication Theory; MGT 1115, Introduction to Business; and MKT 1435, Introduction to Marketing.

In addition, complete the arts and sciences core curriculum (see page 3).

Minor in Art

History of architecture. ART 1200, Ancient Architecture; ART 1203, Medieval Architecture; ART 1204, Renaissance Architecture; ART 1223, American Architecture; ART 1225, Modern Architecture 1; and ART 1228, Modern Architecture 2.

Studio art. ART 1124, Basic Drawing; ART 1127, Basic Painting; ART 1130, Visual Studies Foundation 1; ART 1132, Principles of Graphics; ART 1138, Introduction to Printmaking; and ART 1243, Graphic Design 2 or ART 1254, Intermediate Drawing.

Graphic design. ART 1130, Visual Studies Foundation 1; ART 1131, Visual Studies Foundation 2; ART 1132, Principles of Graphics; ART 1134, Typography; ART 1241, Advertising Design or ART 1243, Graphic Design 2; and ART 1250, Color Theory and Practice.

Photography. ART 1160, Introduction to Photography; ART 1261, Intermediate Black and White Photography; ART 1230, History of Photography; ART 1233, Contemporary Directions in Photography; ART 1263, Introduction to Color Photography; and ART 1363, Advanced Photography Seminar.

General minor. Selection of any six courses from the departmental curriculum.

Biochemistry

Bachelor of Science

BIO 1103, BIO 1104, BIO 1105, Principles of Biology 1, 2, and 3; BIO 1260, Genetics and Developmental Biology; BIO 1461, General Biochemistry 1; BIO 1462, General Biochemistry Lab; BIO 1463, General Biochemistry 3; BIO 1467, Molecular Biology; and BIO 1480, Senior Biochemistry Seminar.

CHM 1111, CHM 1112, General Chemistry for Life Sciences 1 and 2 or CHM 1151, CHM 1152, General Chemistry for Science Majors 1 and 2; CHM 1153, The Chemical Elements; CHM 1221, Analytical Chemistry; CHM 1271, CHM 1272, CHM 1273, Organic Chemistry for Chemistry Majors 1, 2, and 3; and CHM 1280, CHM 1281, Physical Chemistry 1 and 2.

MTH 1140, MTH 1141, MTH 1142, Calculus 1, 2, and 3; PHY 1201, PHY 1202, PHY 1203, Physics for the Life Sciences 1, 2, and 3 or PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors 1, 2, and 3; two quarters of corresponding physics lab courses; six advanced biology and chemistry electives (minimum of two from each discipline); and demonstrated computer literacy.

In addition, complete the arts and sciences core curriculum (see page 3).

Biology

Bachelor of Arts

BIO 1103, Principles of Biology 1; BIO 1104, Principles of Biology 2; BIO 1105, Principles of Biology 3; BIO 1211, Environmental and Population Biology; BIO 1260, Genetics and Developmental Biology; BIO 1261, Cell Physiology and Biochemistry; and four advanced biology electives approved by department Advisory Committee.

MTH 1106, Fundamentals of Mathematics; MTH 1107, Functions and Basic Calculus; or Calculus (one year); PHY 1201, PHY 1202, Physics for the Life Sciences 1 and 2, PHY 1501, PHY 1502, Physics Lab for the Life Sciences 1 and 2; or PHY 1231, Physics for Science Majors 1; and PHY 1232, Physics for Science Majors 2, or PHY 1233, Physics for Science Majors 3; PHY 1531, PHY 1532, or PHY 1533, Physics Lab for Science Majors 1 and 2 or 3; CHM 1111, General Chemistry I; CHM 1122, General Chemistry 2; CHM 1221, Analytical Chemistry; and CHM 1264, CHM 1265, Organic Chemistry 1 and 2.

In addition, complete the arts and sciences core curriculum (see page 3).

Bachelor of Science

BIO 1103, Principles of Biology 1; BIO 1104, Principles of Biology 2; BIO 1105, Principles of Biology 3; BIO 1211, Environmental and Population Biology; BIO 1260, Genetics and Developmental Biology; BIO 1261, Cell Physiology and Biochemistry; BIO 1490, Senior Seminar; four advanced biology electives approved by department Advisory Committee.

Calculus (one year); PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors 1, 2, and 3; PHY 1531, PHY 1532, Physics Lab for Science Majors 1 and 2 or PHY 1533, Physics Lab for Science Majors 3; CHM 1111, General Chemistry 1; CHM 1122, General Chemistry 2; CHM 1221, Analytical Chemistry; CHM 1264, CHM 1265, Organic Chemistry 1 and 2; and two additional advanced science electives approved by department Advisory Committee. Foreign language requirement.

In addition, complete the arts and sciences core curriculum (see page 3).

Chemistry

Bachelor of Arts

CHM 1151, CHM 1152, General Chemistry for Science Majors 1 and 2; CHM 1153, The Chemical Elements; CHM 1231, Analytical Chemistry for Chemistry Majors; CHM 1271, CHM 1272, CHM 1273, Organic Chemistry for Chemistry Majors and Chemical Engineering Students 1, 2, and 3; CHM 1381, CHM 1382, CHM 1383, Physical Chemistry 1,

2, and 3; CHM 1394, CHM 1395, CHM 1396, Experimental Physical Chemistry 1, 2, and 3; CHM 1422, Instrumental Methods of Analysis; and CHM 1432, Instrumental Analysis Lab.

In addition, complete the arts and sciences core curriculum (see page 3).

MTH 1140, MTH 1141, MTH 1142, Calculus 1, 2, and 3; MTH 1243, Calculus and Linear Methods 1 or MTH 1223, Calculus 4; PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors 1, 2, and 3; and PHY 1532, PHY 1533, Physics Lab for Science Majors 2 and 3.

Bachelor of Science

CHM 1151, CHM 1152, General Chemistry for Science Majors 1 and 2; CHM 1153, The Chemical Elements; CHM 1231, Analytical Chemistry for Chemistry Majors; CHM 1271, CHM 1272, CHM 1273, Organic Chemistry for Chemistry Majors and Chemical Engineering Students 1, 2, and 3; CHM 1381, CHM 1382, CHM 1383, Physical Chemistry 1, 2, and 3; CHM 1394, CHM 1395, CHM 1396, Experimental Physical Chemistry 1, 2, and 3; CHM 1422, Instrumental Methods of Analysis; CHM 1432, Instrumental Analysis Lab; CHM 1441, Advanced Inorganic Chemistry; CHM 1451, Experimental Inorganic Chemistry; CHM 1461, Identification of Organic Compounds; CHM 1811, Advanced Chemical Lab Practice 1; and two advanced science or mathematics electives.

MTH 1140, MTH 1141, MTH 1142, Calculus 1, 2, and 3; MTH 1243, Calculus and Linear Methods 1 or MTH 1223, Calculus 4; MTH 1245, Differential Equations and Linear Methods 1 or MTH 1225, Mathematical Analysis; PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors 1, 2, and 3; and PHY 1532, PHY 1533, Physics Lab for Science Majors 2 and 3.

In addition, complete the arts and sciences core curriculum (see page 3).

Minor in Chemistry

After a general chemistry sequence, CHM 1231, Analytical Chemistry for Chemistry Majors; CHM 1271, CHM 1272, CHM 1273, Organic Chemistry for Chemistry Majors and Chemical Engineering Students 1, 2, 3; CHM 1381, CHM 1382, Physical Chemistry 1 and 2; and CHM 1394, CHM 1395, Experimental Physical Chemistry 1 and 2.

Economics

Bachelor of Arts

ECN 1115, Principles of Macroeconomics; ECN 1116, Principles of Microeconomics; ECN 1250, ECN 1251, Statistics 1 and 2; ECN 1216, Microeconomic Theory; ECN 1215, Macroeconomic Theory; ECN 1337, History of Economic Thought; six economics electives.

MTH 1113, College Mathematics for Business and Economics; MTH 1114, Calculus for Business and

Economics; and four social science electives other than economics.

In addition, complete the arts and sciences core curriculum (see page 3).

Bachelor of Science

ECN 1115, Principles of Macroeconomics; ECN 1116, Principles of Microeconomics; ECN 1250, ECN 1251, Statistics 1 and 2; ECN 1216, Microeconomic Theory; ECN 1215, Macroeconomic Theory; ECN 1350, Introduction to Econometrics or ECN 1351, Problems in Economic Research; and ten economics electives.

MTH 1113, College Mathematics for Business and Economics; MTH 1114, Calculus for Business and Economics; and four social science electives other than economics.

In addition, complete the arts and sciences core curriculum (see page 3).

Minor in Economics

ECN 1115, Principles of Macroeconomics; ECN 1116, Principles of Microeconomics; ECN 1216, Microeconomic Theory; ECN 1215, Macroeconomic Theory; and four electives in economics. Electives to be selected with the advice of a department adviser. Any course taken outside the Department of Economics to satisfy these economics elective requirements must be approved by a faculty adviser in the department.

English

Bachelor of Arts

ENG 1126, Backgrounds in English and American Literature; ENG 1120, ENG 1121, Survey of English Literature 1 and 2; ENG 1123, ENG 1124, Survey of American Literature 1 and 2; ENG 1307, Approaches to Literature; two period courses; three major figure courses (one must be Shakespeare); one language or writing course; one genre course; one alternative literature course; one junior/senior seminar; and three electives in English.

In addition, complete the arts and sciences core curriculum (see page 3).

Bachelor of Science

ENG 1126, Backgrounds in English and American Literature; ENG 1120, ENG 1121, Survey of English Literature 1 and 2; ENG 1123, ENG 1124, Survey of American Literature 1 and 2; ENG 1307, Approaches to Literature; two period courses; three major figure courses (one must be Shakespeare); one language or writing course; one genre course; one alternative literature course; one junior/senior seminar; and three electives in English.

In addition, complete the arts and sciences core curriculum (see page 3).

Minor in Literature

Six courses required. Two survey courses required from the following: ENG 1120, Survey of English Literature 1; ENG 1121, Survey of English Literature 2; ENG 1123, Survey of American Literature 1; ENG 1124, Survey of American Literature 2. One course from two of the following categories: (a) literary periods; (b) major figures; and (c) language and writing. One elective from (a), (b) or (c). A junior/senior seminar.

Minor in Writing

Six courses required, four from the following: ENG 1350, Intermediate Writing; ENG 1351, Creative Writing; ENG 1125, Technical Writing 1; ENG 1370, Technical Writing 2; ENG 1352, Advanced Writing; ENG 1381, Writing for the Professions: Business Administration; ENG 1382, Writing for the Professions: Criminal Justice; ENG 1357, Poetry Workshop; ENG 1358, Fiction Workshop; ENG 1362, Publication Arts; ENG 1359, Nonfiction Workshop; and two electives chosen from the courses listed or literature courses.

Minor in Linguistics

See Interdisciplinary Minors.

Minor in Technical Communication

See Interdisciplinary Minors.

Geology

Bachelor of Arts in Geology

GEO 1212, Physical Geology; GEO 1213, Physical Geology Lab; GEO 1222, Historical Geology; GEO 1223, Historical Geology Lab; GEO 1310, Descriptive Mineralogy; GEO 1308, Petrology; GEO 1440, Geomorphology; GEO 1418, Structural Geology; and five geology electives.

MTH 1106, Fundamentals of Mathematics; MTH 1107, Functions and Basic Calculus; *or* MTH 1107, Functions and Basic Calculus; MTH 1108, Calculus; PHY 1231, Physics for Science Majors *or* PHY 1201, Physics for the Life Sciences 1; CHM 1111, General Chemistry 1; and CHM 1122, General Chemistry 2.

In addition, complete the arts and sciences core curriculum (see page 3).

Bachelor of Science in Geology

GEO 1212, Physical Geology; GEO 1213, Physical Geology Lab; GEO 1222, Historical Geology; GEO 1223, Historical Geology Lab; GEO 1310, Descriptive Mineralogy; GEO 1311, Optical Crystallography; GEO 1308, Petrology; GEO 1418, Structural Geology; GEO 1440, Geomorphology; and eight geology electives.

MTH 1107, Functions and Basic Calculus; MTH 1108, Calculus *or* MTH 1123, MTH 1124, MTH 1125, Calculus 1, 2, and 3; PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors 1, 2, and 3; CHM 1111, CHM 1122; *or* CHM 1151, CHM 1152, General Chemistry 1 and 2; CHM 1231 *or* CHM

1221, Analytical Chemistry; *or* CHM 1391, Physical Chemistry; *or* GEO 1412, Geochemistry; and two approved additional science electives.

In addition, complete the arts and sciences core curriculum (see page 3).

Minor in Geology

GEO 1212, Physical Geology; GEO 1222, Historical Geology; GEO 1308, Petrology; GEO 1213, Physical Geology Lab; GEO 1223, Historical Geology Lab; plus four geology electives (GEO 1250 or higher number) chosen with the approval of the geology department.

Bachelor of Arts in Environmental Geology

GEO 1212, Physical Geology; GEO 1213, Physical Geology Lab; GEO 1222, Historical Geology; GEO 1223, Historical Geology Lab; GEO 1308, Petrology; GEO 1440, Geomorphology; GEO 1438, Geology and Land-use Planning; and five geology electives.

MTH 1107, Functions and Basic Calculus; MTH 1108, Calculus *or* MTH 1106, Fundamentals of Mathematics and MTH 1107, Functions and Basic Calculus; BIO 1103, BIO 1104, Principles of Biology 1 and 2; CHM 1111, CHM 1122, General Chemistry 1 and 2.

In addition, complete the arts and sciences core curriculum (see page 3).

Bachelor of Science in Environmental Geology

GEO 1212, Physical Geology; GEO 1213, Physical Geology Lab; GEO 1222, Historical Geology; GEO 1223, Historical Geology Lab; GEO 1308, Petrology; GEO 1440, Geomorphology; GEO 1310, Descriptive Mineralogy; GEO 1438, Geology and Land-use Planning; GEO 1442, Water in Environmental Planning; and eight geology electives.

MTH 1107, Functions and Basic Calculus; MTH 1108, Calculus; PHY 1231, PHY 1232, PHY 1233, Physics for Sciences Majors 1, 2, and 3 *or* BIO 1103, BIO 1104, BIO 1105, Principles of Biology 1, 2, and 3; CHM 1111, CHM 1122, General Chemistry 1 and 2; and CHM 1211, Analytical Chemistry *or* GEO 1412, Geochemistry; and two approved additional science electives.

In addition, complete the arts and sciences core curriculum (see page 3).

Minor in Environmental Geology

GEO 1212, Physical Geology *or* GEO 1140, Environmental Geology; GEO 1213, Physical Geology Lab; GEO 1222, Historical Geology; GEO 1223, Historical Geology Lab; GEO 1438, Geology and Land-use Planning; plus four geology electives (GEO 1250 or higher number) chosen with the approval of the geology department.

History

Bachelor of Arts

HST 1101, Western Civilization to 1648; HST 1102, Western Civilization since 1648; HST 1201

and HST 1202, The United States to 1877 and United States since 1877; HST 1241, The Historian's Craft; HST 1805, Approaches to History; nine history electives distributed as follows: two courses in Group A (ancient, medieval, early modern Europe); two courses in Group B (modern Europe); two courses in Group C (America); two courses in Group D (other regions); and one course in any of the above groups.

In addition, students must complete the arts and sciences core curriculum (see page 3).

Recommended: Courses in the related social sciences.

Bachelor of Science

HST 1101, Western Civilization to 1648; and HST 1102, Western Civilization since 1648; HST 1201 and HST 1202, The United States to 1877 and United States since 1877; HST 1241, The Historian's Craft; HST 1251, Social Science Methodology; HST 1805, Approaches to History; eleven history electives distributed as follows: two courses in Group A (ancient, medieval, and early modern Europe); two courses in Group B (modern Europe); two courses in Group C (America); two courses in Group D (other regions); and three courses in any of the above groups.

A minor approved by the student's adviser; a statistics course (for example, PSY 1211, SOC 1320, or ECN 1250); and a computer course, preferably COM 1105.

In addition, complete the arts and sciences core curriculum (see page 3).

Minor in History

Eight courses in history, two of which must be selected from the following: HST 1101, Western Civilization to 1648; HST 1102, Western Civilization since 1648; HST 1201, The United States to 1877; and HST 1202, The United States since 1877.

Human Services

Bachelor of Arts

Prerequisite courses. SOC 1100, Introduction to Sociology, or ED 1100, Education and Social Science; ED 1302, The Human Services Professions; PSY 1111 and PSY 1112, Foundations of Psychology 1 and 2, or ED 1102 and ED 1103, Human Development and Learning 1 and 2; POL 1111, Introduction to American Government, or equivalent; ECN 1115 or ECN 1116, Principles of Macroeconomics, or Principles of Microeconomics, or equivalent.

Core courses. PSY 1211, Statistics in Behavioral Science 1, or SOC 1320, Introduction to Statistical Analysis, or ED 1307, Introduction to Educational Statistics; PSY 1511, Experimental Design in Psychology, or SOC 1321, Research Methods 1, or

SOC 1324, Human Services Research and Evaluation; SOC 1240, Sociology of Human Services Organizations; PSY 1272, Personality 1; PSY 1373, Abnormal Psychology 1; CRS 1314, Introduction to Counseling; SPC 1338, Group Discussion, or SPC 1330, Interpersonal Communication 1, or ED 1317, Seminar in Group Process; CRS 1310, Intervention Strategies; and INT 1333, Senior Seminar.

Social and community issues. Three courses focused on subjects such as poverty and welfare, minority affairs, special needs populations, and other contemporary American social problems, chosen with the student's academic adviser.

Human services specialization. Five courses in a particular subfield of human services, chosen with the student's academic adviser.

Human services fieldwork. INT 1336, Field Experience in Human Services 1, and INT 1337, Field Experience in Human Services 2.

In addition, complete the arts and sciences core curriculum (see page 3).

Specialization in Deaf Studies

Prerequisite courses, core courses, and fieldwork courses follow the standard human services major.

Three social and community issues courses selected from the subjects suggested above and/or from the following specific alternatives. PSY 1271, or SOC 1135, Social Psychology; SOA 1135, Language and Culture; SOA 1101, Cultural Meaning, and Everyday Experience; ENG 1118, Introduction to Language and Linguistics; PSY 1263, Nonverbal Communication; SOC 1140, Sociology of Prejudice; and SPC 1232, Female/Male Communication.

Deaf studies specialization. ASL 1101, American Sign Language 1; ASL 1102, American Sign Language 2; ASL 1201, Intermediate American Sign Language 1; ASL 1202, Intermediate American Sign Language 2; and five courses selected from: ASL 1211, Deaf Culture; ASL 1212, Deaf History; PSY 1363, American Sign Language Linguistics; PSY 1261, Bilingualism; SLA 1101, Introduction to Speech and Hearing; and ASL 1401, American Sign Language Literature.

Interdisciplinary Studies

Independent Major

An eligible student may petition the College Curriculum Committee to meet requirements for the BA degree in an independent major. Eligibility, procedures, and requirements must be discussed in advance with an adviser in the Office of the Dean, 400 Meserve Hall. No student may be considered for an independent major until a curriculum proposal has been submitted to, and approved by, the College Curriculum Committee.

Minor in Asian Studies

Whatever a student's major or interests, the minor in Asian Studies provides an important opportunity to augment knowledge of Asian culture, history, and politics. The minor program allows students to choose a concentration in Middle Eastern studies or East Asian studies (China, Japan, Korea). Courses cover a range of academic disciplines: anthropology, history, music, philosophy and religion, sociology, language, and political science. In each concentration, three core courses and four electives are required.

Middle Eastern studies concentration. Required courses: HST 1612, The Modern Middle East; PHL 1280, Islam; and POL 1345, Government and Politics in the Middle East. Choose four electives: ECN 1332, Economic History of Less Developed Countries; HST 1613, Contemporary Middle East; HST 1614, The Middle East Today in Fact, Fiction, and Film; HST 1652, Islam Resurgent; MUS 1182, Music of the Middle East; and POL 1384, Arab-Israeli Conflict.

East Asian studies concentration. Required courses: HST 1637, Modern Japan; PHL 1275, Eastern Religions; and POL 1371, Government and Politics of China. Choose four electives: HST 1150, Introduction to Third World History; HST 1633, Modern China; HST 1634, Contemporary China; POL 1332, Government and Politics of Japan; HST 1641, Recent Leaders of Asia; PHL 1130, Ethics: East and West; PHL 1255, Indian Philosophy; PHL 1250, Chinese Philosophy; PHL 1293, Mysticism: East and West; POL 1372, China's Foreign Relations; and SOC 1104, Contemporary Japanese Culture and Society.

For both concentrations, it is strongly recommended that students pursue language training to gain proficiency in an Asian language. Chinese courses are currently taught in the Basic College program.

Minor in Cinema Studies

The minor in cinema studies permits students to acquire skills in the analysis of one of the major art forms and cultural influences of the twentieth century and to gain critical tools that can be used to study the relationships between film and society, history, aesthetics, performance, philosophy, and psychoanalysis. Students take eight courses, including two required courses, a filmmaking requirement, and five electives. Due to their interdisciplinary nature, courses are listed in several departments.

Required courses. LNF 1550, Introductory Film Analysis; and LNF 1551, Film Theory.

Filmmaking requirement. One of the following: ART 1171, Animation Workshop; ART 1180, Video Basics; or SPC 1450, Television 1.

Electives. ART 1233, Contemporary Directions in Cinema; ART 1235, History of Film; ART 1236,

The American Film; ART 1238, Documentary Film; ART 1281, Video Project; DRA 1316, Acting for the Camera; DRA 1849, Special Topics; ENG 1288, Film and Text; ENG 1289, Shakespeare on Film; ENG 1290, Topics in Film (may not be counted more than twice); ENG 1291, Popular Culture; ENG 1294, Modern Film; ENG 1296, Topics in Film; ENG 1297, Approaches to Film; HST 1494, History and Film; HST 1575, History of Media in America; INT 1320, Exploring the Humanities through Film; INT 1321, Modernism; LNF 1521, French Film Masterpieces; LNF 1560, Film and Psychoanalysis; LNG 1554, Modern German Film and Literature; LNS 1550, Spanish Film Masterpieces; MUS 1139, Film Music; SOA 1120, Camera on Culture: Visual Anthropology; SPC 1454, Programming for Radio and Television; SPC 1455, Television 2; SPC 1554, Special Topics in Broadcasting (when appropriate).

For more information, contact the director of cinema studies, Professor Inez Hedges (1 Boston YMCA), at 617-437-5163.

Minor in Linguistics

A total of six courses is required. ENG 1118, Introduction to Language and Linguistics. Choose one course from: ENG 1401, Introduction to Syntax; PSY 1262, Psychology of Language; and PSY 1361, Introduction to Phonetics. Choose four courses from: ENG 1119, History of the English Language; *ENG 1401, Introduction to Syntax; ENG 1402, Grammars of English; ENG 1407, Introduction to Semantics; ENG 1408, Topics in Linguistics; ENG 1690, Junior/Senior Seminar (in Linguistics or Stylistics); LNF 1250, History of the French Language; LNL 1235, Applied Linguistics 1; LNL 1236, Applied Linguistics 2; LNS 1250, History of the Spanish Language; LNL 1260, Introduction to Romance Linguistics; PHL 1215, Symbolic Logic; PHL 1440, Philosophy of Language; PSY 1261, Bilingualism; *PSY 1262, Psychology of Language; PSY 1263, Non-verbal Communication; *PSY 1361, Introduction to Phonetics; PSY 1362, Child Language; PSY 1363, Linguistics of American Sign Language; PSY 1364, Cognition; PSY 1365, Language and the Brain; PSY 1562, Laboratory in Psycholinguistics; PSY 1661, Seminar in Psycholinguistics; PSY 1662, Seminar in Cognition; and SOA 1335, Language and Culture.

*If not already taken.

Minor in Marine Studies

The marine studies minor provides a program of study in the multidisciplinary aspects of the marine environment. The program emphasizes either the scientific or social science/humanistic study of the oceans.

At least six marine-related courses totaling 24 QH are required. Two courses must be beyond the introductory level, and at least one course must be

from the natural sciences and one from the social sciences/humanities.

Mastery of a marine-related skill such as scuba diving, piloting and navigation, or sailing is required. This can be achieved through coursework of an approved outside certification. Coursework in marine skills is normally limited to one of the six required courses.

A project involving some degree of independent study of a marine-related topic must be completed. This can be accomplished by a directed studies course in marine studies, or, with approval, by completion of a major course-related project or outside project.

For more information, contact Professor Peter Rosen, marine studies coordinator, at 617-437-3176.

Minor in Media Studies

To qualify for a minor in media studies, the student must complete a minimum of eight courses as follows. Three required courses: SPC 1250, Introduction to Mass Communication; HST 1575, History of Media in America; and SPC 1300, Introduction to Communication Theory or SPC 1317, Theories of Audience Behavior; or INT 1320, Exploring Humanities through Film; and five elective courses from the two categories media production and media application (at least two electives in each category). Individual student programs will be developed in consultation with faculty advisers. Students should contact Dr. Zaremba (Department of Speech Communication) for information on program development and elective choices.

Minor in Technical Communication

Technical communication combines written, oral, and graphics skills with a background in science or technology. The minor in technical communication gives students the opportunity to prepare themselves for careers as technical writers, or for careers in which technical communication is a significant part of their jobs. Students in English or other liberal arts studies may elect the minor, as may students from a variety of technological or scientific fields. A student does not have to be enrolled in the College of Arts and Sciences to declare the minor.

Eight courses are required. Students must choose courses from the following areas.

Writing courses.

ENG 1125 Technical Writing (Required)

Choose two of the following.

ENG 1352 Advanced Writing
ENG 1370 Technical Writing 2
ENG 1371 Writing for the Computer Industry
ENG 1380 Writing for the Professions:
Health Services

ENG 1381 Writing for the Professions:
Business Administration

One of these courses must be ENG 1370 or 1371.

Speech communication courses.

Choose one.

SPC 1116 Business and Professional Speaking
SPC 1331 Interpersonal Communication 2

Graphic arts courses.

JRN 1440 Design and Graphics (You may take an equivalent in another department or college.)

Computer programming courses.

COM 1101 Algorithms and Data Structures 1
(Required)

Computer science and science courses.

Choose two courses, preferably both within the same discipline.

BIO 1106 General Biology
BIO 1107 Animal Biology
CHM 1111 General Chemistry 1
CHM 1112 General Chemistry 2
GE 1106 Programming Computers
GEO 1212 Physical Geology
GEO 1222 Historical Geology
IIS 1125 COBOL Programming 1
PHY 1231 Physics for Science Majors 1
PHY 1232 Physics for Science Majors 2
PHY 1233 Physics for Science Majors 3

Minor in Urban Studies

Students must take 28 QH (seven courses).

Required courses (three): SOC 1147, Cities and Society; POL 1324, Urban Politics; ECN 1320, Urban Economics. One course from each of the following four areas: *Urban Problems and Policies* (SOC 1346, Suburb and Metropolis; POL 1318, State and Local Government; ECN 1321, Urban Economic Problems and Policies), *Urban Humanities* (HST 1391, European Urban History to 1850; HST 1543, American Urban History; ENG 1608, The City in Literature), *Urban Form and Design* (ART 1113, Architecture and the City; ART 1225, Modern Architecture 1; ART 1150, Architectural Design 1), and *African-American Studies* (AFR 1261, Economics of Urban Poverty; AFR 1275, Urban Political Issues; AFR 1475, Public Policy Analysis).

To obtain credit for the minor, students must file a petition form with the College of Arts and Sciences. Interested students should confer with an adviser as soon as possible. Advisers are: Professor Robert Gilbert, political science, 303 Meserve Hall, 617-437-2796; Professor Clay McShane, history, 249 Meserve Hall, 617-437-2660; Professor Peter Serenyi, art and architecture, 239 Ryder Hall, 617-437-2347; Professor Gregory Wassall, economics, 317 Lake Hall, 617-437-2196.

Minor in Women's Studies

Students take a total of nine courses: four required interdisciplinary courses and five electives.

Required interdisciplinary courses. HST 1490/INT 1150, Introduction to Women's Studies; SOC 1302/INT 1302, Female Perspectives on Society; INT 1151, Seminar in Research 1; and INT 1152, Seminar in Research 2.

Elective courses. AFR 1241, Black Family; AFR 1480, Black Man/Black Woman; BIO 1187, Biology of Human Reproduction; CJ 1616, Women and the Criminal Justice System; ECN 1312, Women in the Labor Market; ENG 1551, Gender Roles in Literature; ENG 1600, Topics in Literature; ENG 1602, Major Figure; other literature courses when gender-oriented; HST 1392, Women in Pre-Industrial Europe; HST 1472, The Family in Pre-Industrial Europe; HST 1473, Women in Modern Europe; HST 1554, Women in America; HST 1644, Third World Women; LNF 1560, Film and Psychoanalysis; LNS 1510, Saints and Sinners; MUS 1106, Women in Music; MUS 1800, Directed Study; NUR 1303, Life Crisis: Analysis and Response; PHL 1295, Medicine, Religion, and the Healer's Art; POL 1316, Contemporary Revolutionary Politics; POL 1327, Sex Roles in American Politics; POL 1328, Women in Public Management; PSY 1218, Psychology of Women; SOA 1160, Sex, Sex Roles, and the Family; SOA 1301, Human Origins; SOA 1303, Sexuality and Culture; SOC 1155, Sociology of the Family; SOC 1160, Sex-Gender Roles in a Changing Society; SOC 1177, Social Roles in the Business World; SOC 1178, Women Working; SOC 1217, Women, Health, and Social Change; and SPC 1232, Female/Male Communication.

Graduate courses offered as electives. English: Topics in Literature courses accepted when focused on women; HST 3370, Seminar in History of the Family; HST 3399, Seminar in Approaches to Women's History; POL 3665, Women in Public Management; POL 3667, Equal Opportunity in Public Administration; POL 3668, Legal Issues in Public Personnel Administration; SOA 3102, Class and State Formation; SOA 3156, Gender, Kinship, and Social Change; SOC 3155, The Family; SOC 3160, Women, Men, and Social Change; SOC 3175, Sociology of Work; SOC 3304, Feminist Theory; and SOC 3410, Contemporary Issues in Sociology.

These courses represent the most current listing. New courses are continually being developed and added to the program. For more information and the most recent brochure describing the Women's Studies Program, contact Professor Laura Frader at 617-437-4442.

Journalism

Bachelor of Arts

Bachelor of Science

Each major will complete the journalism core and one of four concentrations—newspaper/print, radio-television news, advertising, or public relations—to correspond with his/her career objective.

Journalism core. JRN 1103, Newswriting 1; JRN 1104, Newswriting 2; JRN 1206, Editing; JRN 1301, Basic Photojournalism; JRN 1501, History of Journalism; JRN 1508, Law of the Press; and JRN 1512, Journalism Ethics and Issues.

Newspaper/print concentration. JRN 1305, Techniques of Journalism; JRN 1432, Local Government Reporting; JRN 1440, Design and Graphics; JRN 1575, Publication Production and Management; and one journalism elective.

Radio/television news concentration. JRN 1320, Radio News Gathering and Writing; JRN 1421, Television Newswriting; JRN 1422, Television News Production; JRN 1890, Directed Study; and one journalism elective.

Public relations concentration. JRN 1336, Public Relations Principles; JRN 1440, Design and Graphics; JRN 1460, Public Relations Problems; JRN 1561, Public Relations Practice; and one journalism elective.

Advertising concentration. JRN 1350, Advertising Principles; JRN 1440, Design and Graphics; JRN 1451, Advertising Copy Writing; JRN 1552, Advertising Practice; and one journalism elective.

Each major will complete the following related requirements.

ENG 1275, Grammar for Journalists; ENG 1110, Freshman English 1; ENG 1111, Freshman English 2. One course from this list: ENG 1120, Survey of English Literature 1; ENG 1121, Survey of English Literature 2; ENG 1123, Survey of American Literature 1; ENG 1124, Survey of American Literature 2; and one additional English or American literature elective.

POL 1310, American Ideology; POL 1318, State and Local Government; HST 1201, United States to 1877; HST 1202, United States since 1877; ECN 1115, Principles of Macroeconomics; and one additional course in economics or business; MTH 1152, Statistical Thinking; PHL 1200, Introduction to Logic 1; PHL 1140, Social and Political Philosophy; two history electives; and COP 1135, Professional Development for Journalists.

MUS 1109, Introduction to Art, Drama, and Music or one course from each of the following

categories—

(a): ART 1106, Introduction to Art; ART 1220, American Art; (b): MUS 1100, Introduction to Music; MUS 1101, Music as a Listening Experience.

Bachelor of Arts

In addition to the journalism and related requirements above, candidates for the bachelor of arts degree will complete three courses in science and/or math.

Students must also complete the arts and sciences core curriculum (see page 3).

Bachelor of Science

In addition to the journalism and related requirements above, candidates for the bachelor of science degree will complete six courses in sciences and/or math.

Students must also complete the arts and sciences core curriculum (see page 3).

Linguistics

Bachelor of Arts

General requirements. ENG 1118, Introduction to Language and Linguistics; PSY 1262, Psychology of Language; PSY 1361, Introduction to Phonetics; SOA 1335, Language and Culture; ENG 1401, Introduction to Syntax; and PHL 1215, Symbolic Logic.

Second language requirement. Proficiency through Intermediate 2 level plus two advanced courses. The college language placement procedures determine proficiency in a spoken second language (see bachelor of science for proficiency in American Sign Language).

Additional courses. Five courses from the following: PSY 1261, Bilingualism; PSY 1362, Child Language; PSY 1363, Linguistics of American Sign Language; PSY 1364, Cognition; PSY 1365, Language and the Brain; PSY 1264, Animal Communication; PSY 1263, Nonverbal Communication; PHL 1440, Philosophy of Language; ENG 1119, History of the English Language; ENG 1402, Grammars of English; ENG 1407, Introduction to Semantics; ENG 1408, Topics in Linguistics; LNF 1250, History of the French Language; LNL 1235, Applied Linguistics; LNL 1236, Advanced Applied Linguistics; LNL 1260, Introduction to Romance Linguistics; and LNS 1250, History of the Spanish Language.

Lab course. PSY 1562, Laboratory in Psycholinguistics.

Seminar. Two from the following: ENG 1690, ENG 1691, Junior, Senior Seminar (linguistics, stylistics); PSY 1661, Seminar in Psycholinguistics; or PSY 1662, Seminar in Cognition.

Practicum. One course in fieldwork, directed study, sign language teaching, or interpreting.

In addition, complete the arts and sciences core curriculum (see page 3).

Bachelor of Science

Same requirement as the bachelor of arts, except that American sign language can count toward the second-language proficiency requirement.

In addition, complete the arts and sciences core curriculum (see page 3).

Mathematics

Bachelor of Arts

MTH 1140, MTH 1141, MTH 1142, Calculus 1, 2, and 3; MTH 1243, MTH 1244, Calculus and Linear Methods 1 and 2; MTH 1245, MTH 1246, Differential Equations and Linear Methods 1 and 2; MTH 1238, Combinatorial Mathematics; MTH 1301, Linear Algebra; MTH 1311, Analysis 1; and three approved mathematics electives selected in consultation with an adviser.

PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors 1, 2, and 3.

In addition, complete the arts and sciences core curriculum (see page 3).

Bachelor of Science

MTH 1140, MTH 1141, MTH 1142, Calculus 1, 2, and 3; MTH 1243, MTH 1244, Calculus and Linear Methods 1 and 2; MTH 1245, MTH 1246, Differential Equations and Linear Methods 1 and 2; MTH 1238, Combinatorial Mathematics; MTH 1301, Linear Algebra; MTH 1311, Analysis 1; and six approved mathematics electives selected in consultation with an adviser.

PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors 1, 2, and 3.

In addition, complete the arts and sciences core curriculum (see page 3).

Minor in Mathematics

Eight MTH courses, of which the following four are required: three courses in calculus (MTH 1140, MTH 1141, MTH 1142, or equivalent); and MTH 1238, Combinatorial Mathematics. (MTH 1137 and MTH 1237 together are permitted to substitute for MTH 1238. If this option is elected, then nine courses are required for the minor.) The remaining four courses are selected with the assistance of a departmental adviser. At least two of these are upper-division mathematics electives (courses with numbers between MTH 1301 and MTH 1399 excluding MTH 1301, MTH 1311, and MTH 1384). None of the four may carry or be equivalent to a number lower than MTH 1200.

Modern Languages

Bachelor of Arts in French, German, Italian, Spanish, or Russian Languages and Literatures

Language proficiency. Students must demonstrate language proficiency by completing language

courses up through the 1202 level or above in both the language of the major and the minor.

Required courses. Ten courses, including ENG 1118, Introduction to Language and Linguistics and LNF 1512, Masterpieces of Modern European Fiction; one or both masterpieces courses (1231 and 1232) in the language; and six or seven additional upper-level departmental courses in the language, no more than two of which may be courses in translation.

In addition, complete the arts and sciences core curriculum (see page 3).

Students wishing to pursue a nonlanguage minor may petition the department.

Minor in French, German, Italian, Spanish, or Russian Studies

Language proficiency requirement. Same as bachelor of arts.

Required courses. ENG 1118, Introduction to Language and Linguistics; LNF 1512, Masterpieces of Modern European Fiction; and six advanced courses in the area of study and related fields. The program of study must be worked out and approved with an adviser.

Minor in French, German, Italian, Spanish, or Russian Language and Literature

Language proficiency requirement. Same as bachelor of arts.

Required Courses. ENG 1118, Introduction to Language and Linguistics; LNF 1512, Masterpieces of Modern European Fiction; one or both masterpieces courses (1231 and 1232) in the language; and two or three courses in the language beyond the 1202 level (two of which may be in translation).

Students should call the Department of Modern Languages, 617-437-2234.

Music

Bachelor of Arts

Concentration in music literature. MUS 1107, Principles of Music Literature; MUS 1201, Theory 1; MUS 1202, Theory 2; MUS 1203, Theory 3; MUS 1204, Theory 4; MUS 1301, Form and Analysis 1; MUS 1302, Form and Analysis 2; MUS 1209, Functional Piano; MUS 1121, Medieval and Renaissance Music; MUS 1122, Music of the Baroque Era; MUS 1123, Music of the Classical Era; MUS 1124, Music of the Romantic Era; MUS 1125, Twentieth-Century Music; ART 1106, Introduction to Art; DRA 1100, Introduction to Theatre Arts; and four approved music electives.

Ensembles: Students must participate in at least one Northeastern University performing ensemble during at least eight of their quarters on campus.

In addition, complete the arts and sciences core curriculum (see page 3).

Concentration in music literature and performance. MUS 1107, Principles of Music Literature; MUS 1201, Theory 1; MUS 1202, Theory 2; MUS 1203, Theory 3; MUS 1204, Theory 4; MUS 1301, Form and Analysis 1; MUS 1209, Functional Piano; MUS 1122, Music of the Baroque Era; MUS 1123, Music of the Classical Era; MUS 1124, Music of the Romantic Era; MUS 1125, Twentieth-Century Music; MUS 1461, Applied Music Lessons (taken six times); ART 1106, Introduction to Art; DRA 1100, Introduction to Theatre Arts; and three approved music electives.

Ensembles: Students must participate in at least one Northeastern University performing ensemble during at least eight of their quarters on campus.

In addition, complete the arts and sciences core curriculum (see page 3).

Concentration in music industry. MUS 1107, Principles of Music Literature; MUS 1201, Theory 1; MUS 1202, Theory 2; MUS 1203, Theory 3; MUS 1209, Functional Piano; MUS 1165, Music Industry 1; MUS 1166, Music Industry 2; MUS 1167, Music Administration; MUS 1170, Music and Technology; MUS 1365, Seminar: Topics in Music Industry; MUS 1172, The Recording Studio; ECN 1115, Principles of Macroeconomics; ECN 1116, Principles of Microeconomics; MGT 1115, Introduction to Business; ACC 1210, Introduction to Accounting; FIN 1438, Introduction to Finance; MKT 1435, Introduction to Marketing; HRM 1432, Organizational Behavior 1; SPC 1452, Radio 1; ART 1106, Introduction to Art or DRA 1100, Introduction to Theatre Arts; descriptive or inferential statistics (MTH 1387 and 1390 or ECN 1250 and 1251 or POL 1301 and 1302); MSC 1441, Operations Management or ENT 1330, Management of Smaller Enterprises; and three approved music electives.

Ensembles: Students must participate in at least one Northeastern University performing ensemble during at least four of their quarters on campus.

In addition, complete the arts and sciences core curriculum (see page 3).

Bachelor of Science

Concentration in music industry. MUS 1107, Principles of Music Literature; MUS 1201, Music Theory 1; MUS 1202, Music Theory 2; MUS 1203, Music Theory 3; MUS 1209, Functional Piano; MUS 1125, Music of the Twentieth Century. Any two of the following four courses: MUS 1121, Medieval and Renaissance Music; MUS 1222, Music of the Baroque Era; MUS 1223, Music of the Classical Era; MUS 1224, Music of the Romantic Era. MUS 1180, Introduction to World Music or one other approved course in non-Western music. MUS 1165, Music Industry 1; MUS 1166, Music Industry 2; MUS 1167, Music Administration; MUS 1170, Music and Technology; MUS 1172, The Recording Studio; MUS 1365, Seminar: Topics in

Music Industry; ECN 1115, Principles of Macroeconomics; ECN 1116, Principles of Microeconomics. Two of the following three pairs of courses in descriptive and inferential statistics: MTH 1387 and 1390; ECN 1250 and 1251; POL 1301 and 1302; MGT 1115, Introduction to Business; ACC 1210, Introduction to Accounting; FIN 1438, Introduction to Finance; MKT 1435, Introduction to Marketing; HRM 1432, Organizational Behavior. One of the following: MSC 1441, Operations Management; ENT 1330, Management of Smaller Enterprises; HST 1102, Western Civilization 2; SPC 1452, Radio 1. One of the following: ART 1106, Introduction to Art (or another approved art course); DRA 1100, Introduction to Theatre Arts (or another approved course in theatre).

Ensembles: Students must participate in at least one Northeastern University performing ensemble during at least four of their quarters on campus.

In addition, complete the arts and sciences core curriculum (see page 3).

Minor in Music

MUS 1201, MUS 1202, MUS 1203, Music Theory 1, 2, and 3; MUS 1241, Piano Class 1; MUS 1120, Survey of Music History; one approved music elective; any one of the following courses: MUS 1121, Medieval and Renaissance Music; MUS 1122, Music of the Baroque Era; MUS 1123, Music of the Classical Era; MUS 1124, Music of the Romantic Era; or MUS 1125, Twentieth-Century Music.

Philosophy

Bachelor of Arts

Bachelor of Science

PHL 1225, Ancient Philosophy; PHL 1230, History of Modern Philosophy or PHL 1200, Introduction to Logic 1 or PHL 1215, Symbolic Logic; PHL 1400, Theory of Knowledge or PHL 1405, Metaphysics or PHL 1335, Moral Philosophy; one philosophy seminar; and eight philosophy electives.

In addition, complete the arts and sciences core curriculum (see page 3).

Minor in Philosophy

To qualify for a minor in philosophy, a student must take 28 QH in philosophy to be distributed as follows.

Introductory courses. PHL 1100, Introduction to Philosophy 1 or PHL 1105, Introduction to Scientific Method; *History of philosophy.* PHL 1225, Ancient Philosophy or PHL 1230, History of Modern Philosophy. *Logic requirement.* PHL 1200, Introduction to Logic 1 or PHL 1215, Symbolic Logic. At least one of the following courses: PHL 1142, Philosophy of Mind; PHL 1400, Theory of Knowledge; PHL 1405, Metaphysics; and PHL 1335, Moral Philosophy.

Electives. Three electives; and three electives in philosophy.

Physics

Bachelor of Arts

PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors 1, 2, and 3, and associated labs—PHY 1531, PHY 1532, PHY 1533; PHY 1301, Intermediate Mechanics; PHY 1302, Electric and Magnetic Fields; three upper-level physics lecture courses, and three upper-level lab courses.

MTH 1143, MTH 1144, MTH 1145, Calculus 1, 2, and 3; MTH 1243, MTH 1244, Calculus and Linear Methods 1 and 2; and one advanced mathematics elective.

In addition, complete the arts and sciences core curriculum (see page 3).

Bachelor of Science

PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors 1, 2, and 3, and associated labs — PHY 1531, PHY 1532, PHY 1533; PHY 1301, Intermediate Mechanics; PHY 1302, Electric and Magnetic Fields; PHY 1303, Modern Physics; PHY 1304, Mathematical Physics; PHY 1305, Thermodynamics and Kinetic Theory; PHY 1401, Classical Mechanics; PHY 1402, PHY 1403, Electricity and Magnetism 1 and 2; PHY 1404, Wave Motion and Optics; and three upper-level lab courses.

MTH 1140, MTH 1141, MTH 1142, Calculus 1, 2, and 3; MTH 1243, MTH 1244, Calculus and Linear Methods 1 and 2; MTH 1245, MTH 1246, Differential Equations and Linear Methods 1 and 2; and five additional electives from those approved for majors in the following fields: physics, mathematics, computer science, chemistry, engineering, biology, and geology.

In addition, complete the arts and sciences core curriculum (see page 3).

Bachelor of Science in Applied Physics

PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors 1, 2, and 3, and associated labs—PHY 1531, PHY 1532, PHY 1533; PHY 1301, Intermediate Mechanics; PHY 1302, Electric and Magnetic Fields; PHY 1303, Modern Physics; PHY 1305, Thermodynamics and Kinetic Theory; PHY 1404, Wave Motion and Optics; PHY 1551 and PHY 1552, Electronics for Scientists 1 and 2; PHY 1555, Wave Lab; PHY 1557, Advanced Lab; and PHY 1561, Project Lab.

MTH 1140, MTH 1141, MTH 1142, Calculus 1, 2, and 3; MTH 1243, MTH 1244, Calculus and Linear Methods 1 and 2; MTH 1245, MTH 1246, Differential Equations 1 and 2.

COM 1100, Fundamentals of Computer Science; COM 1101, Algorithms and Data Structures 1; and COM 1201, Data Structures 2. Four additional electives from those approved for majors in the

following fields: physics, mathematics, chemistry, computer science, engineering, biology, and geology.

In addition, complete the arts and sciences core curriculum (see page 3).

Minor in Physics

PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors 1, 2, and 3 *or* PHY 1221, PHY 1222, PHY 1223, Physics for Engineering Students 1, 2, and 3; *and* three upper-level lecture or lab courses from the following list: PHY 1301, PHY 1302, PHY 1303, PHY 1304, PHY 1305, PHY 1401, PHY 1402, PHY 1403, PHY 1404, PHY 1411, PHY 1412, PHY 1413, PHY 1414, PHY 1415, PHY 1416, PHY 1551, PHY 1552, and PHY 1555.

Instrumentation for Science Major

PHY 1231, PHY 1232, PHY 1233, Physics for Science Majors 1, 2, and 3; *or* PHY 1221, PHY 1222, PHY 1223, Physics for Engineering Students 1, 2, and 3.

PHY 1555, Wave Lab; PHY 1551, PHY 1552, Electronics for Scientists 1 and 2; and PHY 1557, Advanced Lab.

Political Science

Bachelor of Arts

POL 1110, Introduction to Politics; POL 1111, Introduction to American Government; POL 1112, Introduction to International Relations; POL 1113, Introduction to Foreign Governments and Societies; POL 1261, Public Administration; one political theory/thought course selected from the following: POL 1370, POL 1373, POL 1374; and seven political science electives.

Six social science electives selected from at least three of the following areas: African-American studies, anthropology, economics, history, psychology (consult the political science department's approved psychology course list), and sociology.

In addition, complete the arts and sciences core curriculum (see page 3).

Bachelor of Science

POL 1110, Introduction to Politics; POL 1111, Introduction to American Government; POL 1112, Introduction to International Relations; POL 1113, Introduction to Foreign Governments and Societies; POL 1261, Public Administration; POL 1301, Research Methods 1; POL 1302, Research Methods 2; and one political theory/thought course selected from the following: POL 1370, POL 1373, POL 1374; and six political science electives.

Six social science electives selected from at least three of the following areas: African-American studies, anthropology, economics, history, psychology (consult the political science department's approved psychology course list), and sociology.

In addition, complete the arts and sciences core curriculum (see page 3).

Concentration in Law and Legal Issues

Bachelor of Arts

POL 1110, Introduction to Politics; POL 1111, Introduction to American Government; POL 1261, Public Administration; POL 1373, Pre-Modern Political Thought *or* POL 1374, Modern Political Thought; six law-related political science electives; and four general political science electives.

Six social science electives selected from at least three of the following areas: African-American studies, anthropology, economics, history, psychology (consult the political science department's approved psychology course list), and sociology.

In addition, complete the arts and sciences core curriculum (see page 3).

Bachelor of Science

POL 1110, Introduction to Politics; POL 1111, Introduction to American Government; POL 1261, Public Administration; POL 1301, Research Methods 1; POL 1302, Research Methods 2; POL 1373, Pre-Modern Political Thought *or* POL 1374, Modern Political Thought; six law-related political science electives; and two general political science electives.

Six social science electives selected from at least three of the following areas: African-American studies, anthropology, economics, history, psychology (consult the political science department's approved psychology course list), and sociology.

In addition, complete the arts and sciences core curriculum (see page 3).

Concentration in Public Administration

Bachelor of Science

POL 1110, Introduction to Politics; POL 1111, Introduction to American Government; POL 1261, Public Administration; POL 1301, Research Methods 1; POL 1302, Research Methods 2; POL 1373, Pre-Modern Political Thought *or* POL 1374, Modern Political Thought; six public administration electives; and two general political science electives.

Six social science electives selected from at least three of the following areas: African-American studies, anthropology, economics, history, psychology, (consult political science department's approved psychology course list) and sociology.

In addition, complete the arts and sciences core curriculum (see page 3).

Minor in Political Science

Any two of the following courses: POL 1110, Introduction to Politics; POL 1111, Introduction to

American Government; POL 1112, Introduction to International Relations; POL 1113, Introduction to Foreign Governments and Societies; POL 1261, Public Administration. Any five additional courses offered by the Department of Political Science for political science majors, including courses listed above that have not been selected to fulfill the above requirement.

Minor in International Politics

POL 1112, Introduction to International Relations; POL 1113, Introduction to Foreign Governments and Societies; any five additional courses in international politics and/or comparative politics offered by the Department of Political Science.

Psychology

Bachelor of Arts and Bachelor of Science

Psychology courses (basic courses). PSY 1110, Perspectives in Psychology 1 or PSY 1111, Foundations of Psychology 1; and PSY 1112, Foundations of Psychology 2 or PSY 1113, Perspectives in Psychology 2; PSY 1211 and PSY 1212, Statistics in Behavioral Science 1 and 2.

Specialty courses. Students choose two courses from the following: PSY 1271, Social Psychology; PSY 1272, Personality 1 or PSY 1373, Abnormal Psychology 1; and PSY 1241, Human Behavioral Development 1. Students also choose three courses from the following: PSY 1262, Psychology of Language or PSY 1364, Cognition; PSY 1231, Learning and Motivation; PSY 1351, Psychobiology; and PSY 1381, Sensation or PSY 1382, Perception for bachelor of arts or bachelor of science degrees below.

Within the psychology department, students may concentrate their electives in a variety of subareas, including: language and cognition; learning and motivation; personality and social psychology; sensory and psychobiology; or individual study. Students should see a department adviser regarding these concentrations.

Additional Requirements for Bachelor of Arts

Four psychology electives; *either* three psychology labs and one psychology directed study *or* one psychology seminar; *or* two psychology labs, one psychology directed study, and one psychology seminar. Students must also complete the arts and sciences core curriculum (see page 3).

Additional Requirements for Bachelor of Science

Seven psychology electives; *either* four psychology labs *or* three psychology labs and one psychology directed study; one psychology seminar.

Four mathematics, science, or computer science courses beyond the core curriculum requirements. Also, one humanities course beyond the core curriculum requirements. Students must also complete the arts and sciences core curriculum (see page 3).

Minor in Psychology

Psychology courses (basic courses). PSY 1110, Perspectives in Psychology 1 or PSY 1111, Foundations of Psychology 1; and PSY 1112, Foundations of Psychology 2 or PSY 1113, Perspectives in Psychology 2; and PSY 1211 and PSY 1212, Statistics in Behavioral Science 1 and 2.

Specialty courses. Students choose two courses from the following: PSY 1271, Social Psychology; PSY 1272, Personality 1 or PSY 1373, Abnormal Psychology 1; PSY 1241, Human Behavioral Development 1; PSY 1262, Psychology of Language or PSY 1364, Cognition; PSY 1231, Learning and Motivation; PSY 1351, Psychobiology; and PSY 1381, Sensation or PSY 1382, Perception.

Students also must take three other psychology courses and one psychology lab.

Sociology-Anthropology

Concentration in Sociology

Bachelor of Arts

Preparatory requirements. SOC 1100, Introduction to Sociology; and SOA 1100, Peoples and Cultures. *Core requirements.* SOC 1320, Introduction to Statistical Analysis; SOC 1321, SOC 1322, Research Methods 1 and 2; SOC 1300, Classical Social Thought; SOC 1301, Current Social Thought; SOC 1310, Class, Power, and Social Change. *Elective requirements.* Two intermediate courses (1100 or 1200 level); two advanced courses (1300, 1400, or 1500 level); and one anthropology course beyond SOA 1100.

Six electives in the social sciences other than sociology/anthropology.

In addition, complete the arts and sciences core curriculum (see page 3).

Bachelor of Science

Preparatory requirements. SOC 1100, Introduction to Sociology and SOA 1100, Peoples and Cultures. *Core requirements.* SOC 1320, Introduction to Statistical Analysis; SOC 1321, SOC 1322, Research Methods 1 and II; SOC 1300, Classical Social Thought; SOC 1301, Current Social Thought; SOC 1310, Class, Power, and Social Change. *Elective requirements.* Two intermediate courses (1100 or 1200 level); two advanced courses (1300, 1400, or 1500 level); and one anthropology course beyond SOA 1100.

Six electives in the social sciences other than sociology/anthropology. Approved six-course specialization.

In addition, complete the arts and sciences core curriculum (see page 3).

Minor in Sociology

Requirements. SOC 1100, Introduction to Sociology; any two courses from among the

following: SOC 1321, Research Methods 1; SOC 1322, Research Methods 2; SOC 1300, Classical Social Thought; SOC 1301, Current Social Thought; any three-course specialization in sociology arranged between the student and adviser; and one additional 1300, 1400, or 1500 level course.

Concentration in Anthropology

Bachelor of Arts

Preparatory requirements. SOA 1100, Peoples and Cultures; and SOC 1100, Introduction to Sociology. *Core Requirements.* At least three of the following: SOA 1335, Language and Communication; SOA 1155, Individual and Culture; SOA 1301, Human Origins; SOA 1160, Sex, Sex Roles, and Family; SOA 1425, Cultural Survival; SOA 1146, Peasants: Community, Culture, and Rebellion; SOA 1470, Myth and Religion. *Elective requirements.* At least six additional anthropology courses; and one sociology elective beyond SOC 1100.

Six electives in the social sciences other than sociology/anthropology.

In addition, complete the arts and sciences core curriculum (see page 3).

Bachelor of Science

Preparatory requirements. SOA 1100, Peoples and Cultures; and SOC 1100, Introduction to Sociology. *Core requirements.* At least three of the following: SOA 1335, Language and Communication; SOA 1155, Individual and Culture; SOA 1301, Human Origins; SOA 1160, Sex, Sex Roles, and Family; SOA 1425, Cultural Survival; SOA 1146, Peasants: Community, Culture, and Rebellion; SOA 1470, Myth and Religion. *Elective requirements.* At least six additional anthropology courses; and one sociology elective beyond SOC 1100.

Six electives in the social sciences other than sociology/anthropology. Approved five-course specialization.

In addition, complete the arts and sciences core curriculum (see page 3).

Minor in Anthropology

Requirements. SOA 1100, Peoples and Cultures; SOA 1335, Language and Communication; SOA 1155, Individual and Culture; SOA 1160, Sex, Sex Roles, and Family; and any two-course specialization in anthropology arranged between the student and adviser.

Speech Communication

Concentration in General Speech Communication

Bachelor of Arts

Bachelor of Science

Required courses. SPC 1115, Introduction to Communication Skills; SPC 1116, Business and Professional Speaking; SPC 1250, Introduction to

Mass Communication; SPC 1300, Introduction to Communication Theory; SPC 1330, Interpersonal Communication 1; and SPC 1600, Introduction to Communication Research or SPC 1610, Rhetorical Criticism.

Eight speech communication electives selected in consultation with an adviser.

In addition, complete the arts and sciences core curriculum (see page 3).

Concentration in Communication Research and Theory

Bachelor of Arts

Bachelor of Science

Required courses. SPC 1115, Introduction to Communication Skills; SPC 1116, Business and Professional Speaking; SPC 1250, Introduction to Mass Communication; SPC 1300, Introduction to Communication Theory; SPC 1310, Rhetorical Theory 1; SPC 1315, Theories of Persuasion; SPC 1317, Theories of Audience Behavior; SPC 1330, Interpersonal Communication 1; SPC 1600, Introduction to Communication Research; and SPC 1610, Rhetorical Criticism.

Five of the following courses. SPC 1318, Negotiation Skills; SPC 1410, Contemporary Public Address; SPC 1430, Organizational Communication 1; SPC 1437, Consultation Skills; SPC 1451, Foundations of Broadcasting; SPC 1555, Communication and the Quality of Life; SPC 1890, Directed Study; and SPC 1895, Internship.

In addition, complete the arts and sciences core curriculum (see page 3).

Concentration in Radio and Television

Bachelor of Arts

Bachelor of Science

Required courses. SPC 1115, Introduction to Communication Skills; SPC 1116, Business and Professional Speaking; SPC 1250, Introduction to Mass Communication; SPC 1300, Introduction to Communication Theory; SPC 1330, Interpersonal Communication 1; SPC 1450, Television 1; SPC 1451, Foundations of Broadcasting; SPC 1452, Radio 1; and SPC 1600, Introduction to Communication Research or SPC 1610, Rhetorical Criticism.

Five of the following courses. SPC 1111, Oral Interpretation; SPC 1317, Theories of Audience Behavior; SPC 1430, Organizational Communication 1; SPC 1431, Organizational Communication 2; SPC 1453, Broadcast Management; SPC 1454, Programming for Radio and Television; SPC 1455, Television 2; SPC 1500, Special Topics in Speech Communication; SPC 1890, Directed Study; SPC 1895, Internship; JRN 1422, Television News Production; and SPC 1555, Communication and the Quality of Life.

In addition, complete the arts and sciences core curriculum (see page 3).

Concentration in Interpersonal and Organizational Communication

Bachelor of Arts Bachelor of Science

Required courses. SPC 1115, Introduction to Communication Skills; SPC 1116, Business and Professional Speaking; SPC 1250, Introduction to Mass Communication; SPC 1300, Introduction to Communication Theory; SPC 1330, Interpersonal Communication 1; SPC 1331, Interpersonal Communication 2; SPC 1338, Group Discussion; SPC 1430, Organizational Communication 1; and SPC 1600, Introduction to Communication Research or SPC 1610, Rhetorical Criticism.

Five of the following courses. SPC 1232, Communication and Gender; SPC 1315, Theories of Persuasion; SPC 1318, Negotiation Skills; SPC 1431, Organizational Communication 2; SPC 1437, Consultation Skills; SPC 1500, Special Topics in Speech Communication; and SPC 1555, Communication and the Quality of Life.

In addition, complete the arts and sciences core curriculum (see page 3).

Concentration in Rhetoric, Advocacy, and Public Address

Bachelor of Arts Bachelor of Science

Required courses. SPC 1115, Introduction to Communication Skills; SPC 1116, Business and Professional Speaking; SPC 1250, Introduction to Mass Communication; SPC 1300, Introduction to Communication Theory; SPC 1330, Interpersonal Communication; SPC 1600, Introduction to Communication Research or SPC 1610, Rhetorical Criticism; SPC 1310, Rhetorical Theory or SPC 1315, Theories of Persuasion; SPC 1110, Voice and Articulation or SPC 1111, Oral Interpretation or SPC 1338, Group Discussion; and SPC 1239, Argumentation and Debate or SPC 1410, Contemporary Public Address or SPC 1415, Persuasive Techniques.

Five of the following courses. SPC 1110, Voice and Articulation; SPC 1111, Oral Interpretation; SPC 1239, Argumentation and Debate; SPC 1240, Competitive Strategies in Oral Communication; SPC 1310, Rhetorical Theory; SPC 1315, Theories of Persuasion; SPC 1317, Theories of Audience Behavior; SPC 1318, Negotiation Skills; SPC 1338, Group Discussion; SPC 1410, Contemporary Public Address; SPC 1415, Persuasive Techniques; SPC 1450, Television 1; SPC 1452, Radio 1; SPC 1500, Special Topics in Speech Communication; SPC 1600, Introduction to Communication Research; SPC 1890, Directed Study; SPC 1895,

Internship; and SPC 1555, Communication and the Quality of Life.

Minor in Speech

Required courses. SPC 1116, Business and Professional Speaking; SPC 1300, Introduction to Communication Theory; SPC 1330, Interpersonal Communication 1; and SPC 1338, Group Discussion.

Four of the following courses. SPC 1110, Voice and Articulation; SPC 1111, Oral Interpretation; SPC 1232, Communication and Gender; SPC 1239, Argumentation and Debate; SPC 1240, Competitive Strategies in Oral Communication; SPC 1250, Introduction to Mass Communication; SPC 1317, Theories of Audience Behavior; SPC 1318, Negotiation Skills; SPC 1331, Interpersonal Communication 2; SPC 1410, Contemporary Public Address; SPC 1415, Persuasive Techniques; SPC 1437, Consultation Skills; and SPC 1600, Introduction to Communication Research.

Theatre

Bachelor of Arts Bachelor of Science

Theatre majors have the opportunity, after the completion of 32 QH, to select one of three concentrations: theatre generalist, production, or performance. Admission to a concentration is by petition or audition.

All theatre majors are required to complete the following department core courses. DRA 1100, Introduction to the Theatre Arts; DRA 1106, Theatre History 1; DRA 1107, Theatre History 2; DRA 1112, Dramatic Theory/Criticism; DRA 1114, Masters of Theatre; DRA 1149, Script Analysis; DRA 1150, Acting 1; DRA 1180, Concepts of Direction; DRA 1200, Stagecraft; DRA 1212, Introduction to Theatrical Design; and DRA 1800, DRA 1801, DRA 1802, and DRA 1803, Practicum in Production. All theatre majors must take ENG 1658, Introduction to Shakespeare, in the college core curriculum.

All theatre majors should select the following courses in their *freshman* year: DRA 1100, Introduction to Theatre Arts; DRA 1150, Acting 1; DRA 1200, Stagecraft; and DRA 1212, Introduction to Theatrical Design.

The following lists specify the requirements for each concentration.

Theatre Generalist. DRA 1116, American Theatre or DRA 1121, Contemporary Theatre; DRA 1210, Scene Design 1; DRA 1226, Lighting for the Stage; DRA 1261, Costuming 1; DRA 1505, Continental Theatre; DRA 1510, Twentieth Century Theatre; and four courses from the following group: DRA 1140, Playwriting; DRA 1160, Body Movement 1; DRA 1280, Stage Makeup; DRA 1284, Theatre

Management; DRA 1325, Musical Theatre Technique; or DRA 1410, Technical Production.

Production. DRA 1209, Theatrical Drafting; DRA 1210, Scene Design 1; DRA 1226, Lighting for the Stage; DRA 1261, Costuming 1; DRA 1284, Theatre Management; DRA 1410, Technical Production; DRA 1505, Continental Drama; DRA 1510, Twentieth Century Theatre; and two courses from the following list: DRA 1213, Scene Design 2; DRA 1225, Scene Painting; DRA 1265, Pattern Drafting; DRA 1280, Stage Makeup; DRA 1400, Costuming 2; or DRA 1430, Lighting 2. All production concentration majors must take electives ART 1101, Art History Since 1400 and ART 1124, Basic Drawing.

Performance. DRA 1116, American Theatre or DRA 1121, Contemporary Theatre; DRA 1155, Voice for the Theatre; DRA 1160, Body Movement 1; DRA 1280, Stage Makeup; DRA 1301, Acting 3; DRA 1302, Acting 4; DRA 1316, Acting for the Camera; DRA 1325, Musical Theatre Technique; DRA 1505, Continental Drama; and DRA 1510, Twentieth Century Theatre. All performance concentration majors must take 4 QH of dance/physical education electives (HSL).

Dance. Not available 1991–1992 academic year.

All students must complete the arts and sciences core curriculum (see page 3).

Minor in Theatre

Students minoring in theatre are required to complete the following courses. DRA 1100, Introduction to Theatre Arts; DRA 1106, Theatre History 1; DRA 1107, Theatre History 2; DRA 1150, Acting 1; DRA 1180, Concepts of Direction; DRA 1200, Stagecraft; DRA 1212, Introduction to Theatrical Design; and one of the following: DRA 1149, Script Analysis; DRA 1210, Scenic Design 1; DRA 1226, Lighting for the Stage; DRA 1261, Costuming 1; and DRA 1300, Acting 2.

Music majors who wish to minor in musical theatre must take the following courses. DRA 1100, Introduction to Theatre Arts; DRA 1149, Script Analysis; DRA 1150 and DRA 1300, Acting 1 and 2; DRA 1160, Movement 1; DRA 1325, Musical Theatre Technique; DRA 1800, DRA 1801, DRA 1802, and DRA 1803, Practicum in Production 1, 2, 3, and 4; and INT 1110, American Musical Theatre.

Laboratory practice in technical theatre and performance is also required.

Boston-Bouvé College of Human Development Professions

Specimen Program in Athletic Training

Quarter 1	BIO 1140, Basic Animal Biology 1; ENG 1110, Freshman English 1; HSL 1133, Physical Conditioning; HSL 1281, Current Issues in Health; and INT 1100, Beginning Computer Use.
Quarter 2	BIO 1141, Basic Animal Biology 2 <i>or</i> elective; CHM 1111, General Chemistry 1; ENG 1111, Freshman English 2; and PSY 1111, Foundations of Psychology 1.
Quarter 3	CHM 1112, General Chemistry 2; HSL 1254, First Aid; MTH 1106, Fundamentals of Mathematics; SOC 1100, Introduction to Sociology; and one general elective.
Quarter 4	HSL 1260, Perceptual Motor Development; HSL 1261, Anatomy and Physiology 1; HSL 1268, Basic Athletic Training Lab; HSL 1605, Basic Athletic Training; PHY 1201, Physics 1; and PHY 1501, Physics 1 Lab.
Quarter 5	HSL 1132, Weight Training; HSL 1463, Overview of Physical Disabilities; HSL 1600, Psychology of Sport; HSL 1608, Clinical Athletic Training; PHY 1202, Physics 2; and PHY 1502, Physics 2 Lab.
Quarter 6	CRS 1314, Introduction to Counseling; HSL 1286, Nutrition; HSL 1609, Advanced Athletic Training 1; and HSL 1611, Kinesiology.
Quarter 7	ENG ____, middler year writing requirement; HSL 1610, Anatomy and Physiology 2; HSL 1628, Advanced Athletic Training 2; HSL 1790, Athletic Training Practicum 1; and PTH 1600, Human Neuroscience.
Quarter 8	ED 1307, Introduction to Educational Statistics <i>or</i> elective; HSL 1500, Mental Health; HSL 1612, Physiology of Exercise; HSL 1627, Therapeutic Modalities in Athletic Training; and HSL 1791, Athletic Training Practicum 2.
Quarter 9	HSL 1266, Physical Conditioning Programming; HSL 1626, Therapeutic Reconditioning in Athletic Training; HSL 1792, Athletic Training Practicum 3; one elective or educational statistics course; and one general elective.
Quarter 10	HSL 1408, Research Methods; HSL 1516, Drug Use and Abuse; HSL 1629, Organization and Administration of Athletic Training; and HSL 1793, Athletic Training Practicum 4.
Quarter 11	HSL 1625, Senior Seminar; HSL 1866, Special Problems; and two electives.

Specimen Program in Cardiovascular Health and Exercise

Quarter 1	BIO 1140, Basic Animal Biology 1; ENG 1110, Freshman English 1; HSL 1133, Physical Conditioning; HSL 1281, Current Issues in Health; and SOC 1100, Introduction to Sociology.
Quarter 2	BIO 1141, Basic Animal Biology 2; ENG 1111, Freshman English 2; HSL 1132, Weight Training; INT 1100, Beginning Computer Use; and PSY 1111, Foundations of Psychology 1.
Quarter 3	CHM 1111, General Chemistry 1; HSL 1101, Intermediate Swimming; HSL 1134, Aerobic Dance and Exercise; HSL 1254, First Aid; HSL ____, health elective; and MTH 1106, Fundamentals of Mathematics.
Quarter 4	ED 1307, Educational Statistics; HSL 1260, Perceptual Motor Development and Learning; HSL 1261, Anatomy and Physiology 1; PHY 1201, Physics 1; and PHY 1501, Physics 1 Lab.
Quarter 5	CHM 1112, General Chemistry 2A; HSL 1282, Wellness; HSL 1605, Basic Athletic Training; and one elective.
Quarter 6	CRS 1313, Introduction to Counseling; HSL 1286, Nutrition; HSL 1611, Kinesiology; and one elective.
Quarter 7	HSL 1610, Anatomy and Physiology 2; ENG ____, middler year writing requirement; and two electives.

Quarter 8	HSL 1408, Research Methods; HSL 1423, Commercial Recreation Marketing; HSL 1426, Budget Analysis; and HSL 1612, Physiology of Exercise.
Quarter 9	HSL 1502, Communicable and Degenerative Diseases; HSL 1613, Lab in Exercise Testing and Prescription; HSL 1614, Electro-cardiography; and HSL ____, Programming for Cardiovascular Health Exercise.
Quarter 10	HSL 1800 and HSL 1801, Field Experience 1 and 2.
Quarter 11	HSL 1506, Patterns of Community Health; HSL 1510, Health Counseling; HSL 1866, Special Problems; and one elective.

Specimen Program in Arts and Sciences/Physical Education Teacher Preparation

As of October 1, 1994, candidates seeking provisional teacher certification at any grade level (N-12) in the Commonwealth of Massachusetts need to earn a bachelor's degree with a major in the liberal arts and sciences. Within five years from becoming provisionally certified, candidates must complete a master's degree in the appropriate teaching discipline to become fully certified in Massachusetts. Accordingly, in addition to extensive study in physical education, each student beginning the program in Fall 1990 must select a major within the College of Arts and Sciences.

Quarter 1	ENG 1110, Freshman English 1; HSL 1101, Intermediate Swimming; HSL 1218, Introduction to Physical Education; and two arts and sciences courses.
Quarter 2	ENG 1111, Freshman English 2; HSL 1109, Beginning Gymnastics 1; HSL 1140, Beginning Basketball; HSL 1254, First Aid; and two arts and sciences courses.
Quarter 3	HSL 1110, HSL 1112, Women's/Men's Gymnastics 2; HSL 1173, Beginning Track and Field; INT 1100, Beginning Computer Use; and three arts and sciences courses.
Quarter 4	HSL 1150, Beginning Soccer; HSL 1258, Elementary School Activities; HSL 1259, Secondary School Activities; HSL 1261, Anatomy and Physiology 1; and two arts and sciences courses.
Quarter 5	HSL 1116, Beginning Tennis; HSL 1260, Perceptual Motor Development and Learning; and three arts and sciences courses.
Quarter 6	HSL 1611, Kinesiology; HSL 1615, Critical Teaching Skills; HSL ____, dance elective; HSL ____, physical education elective; and two arts and sciences electives.
Quarter 7	ENG ____, middler year writing requirement; HSL 1114, Beginning Badminton; HSL 1610, Anatomy and Physiology 2; and two arts and sciences courses.
Quarter 8	HSL 1133, Physical Conditioning; HSL 1463, Overview of Physical Disabilities; HSL 1612, Physiology of Exercise; and two arts and sciences courses.
Quarter 9	HSL 1142, Beginning Volleyball; HSL ____, Theory of Coaching/Dance; and three arts and sciences courses.
Quarter 10	HSL 1802 and HSL 1803, Supervised Student Teaching 1 and 2.
Quarter 11	HSL ____, physical education elective; and four arts and sciences courses.

Specimen Program in Recreation Management

Quarter 1	ED 1100, Education and Social Science; ENG 1110, Freshman English 1; HSL 1220, Foundation of Leadership in Leisure Service; and SPC 1115, Introduction to Communication Skills.
Quarter 2	BIO 1140, Basic Animal Biology 1; ENG 1111, Freshman English 2; HSL 1223, Life and Career Planning; and INT 1100, Beginning Computer Use.
Quarter 3	HSL 1253, Group Dynamics 1; HSL 1281, Current Issues in Health; HSL ____, Professional Skills; MTH 1106, Fundamentals of Mathematics; and an elective.
Quarter 4	ED 1102, Human Development and Learning 1; HSL 1221, Introduction to Recreation and Leisure; HSL 1261, Anatomy and Physiology 1; and one science elective.
Quarter 5	ED 1103, Human Development and Learning 2; HSL 1610, Anatomy and Physiology 2; one guided elective; and one science elective.

Quarter 6*	HSL 1408, Research Methods; HSL 1423, Commercial Recreation Marketing; HSL 1426, Budget Analysis; and one guided elective.
Quarter 7	HSL 1401, Programming Planning in Recreation; HSL 1409, Research Applications; HSL ____, department elective; and two guided electives.
Quarter 8	HSL 1400, Organizational Behavior; HSL 1406, Internship Seminar; HSL 1446, Elements of Outdoor Recreation Planning; HSL ____, department elective; and one guided elective.
Quarter 9	HSL 1800 and HSL 1801, Supervised Field Experience 1 and 2.
Quarter 10	HSL 1403, Concepts of Leisure; HSL 1422, Program Evaluation in Recreation; HSL 1467, Social and Psychological Impacts of Illness and Disabilities; and one guided elective.
Quarter 11	HSL 1410, Senior Seminar; HSL 1421, Administration of Recreation and Parks; HSL ____, therapeutic recreation elective; and one guided elective.

* Beginning with quarter 6, use one elective space to fulfill the middler year writing requirement.

Specimen Program in Arts and Sciences/School Health Education

As of October 1, 1994, candidates seeking provisional teacher certification at any grade level (5–12) in the Commonwealth of Massachusetts need to earn a bachelor's degree with a major in the liberal arts and sciences. Within five years from becoming provisionally certified, candidates must complete a master's degree in the appropriate teaching discipline to become fully certified to teach in Massachusetts. Accordingly, in addition to extensive study in health education, each student in School Health Education must select a major within the College of Arts and Sciences.

Quarter 1	Four arts and sciences courses.
Quarter 2	HSL 1254, First Aid; HSL 1279, Foundations of Health Education; and three arts and sciences courses.
Quarter 3	INT 1100, Beginning Computer Use; and three arts and sciences courses.
Quarter 4	BIO 1152, Integrated Anatomy and Physiology 1; HSL 1285, Health Concerns of Youth; and two arts and sciences courses.
Quarter 5	BIO 1153, Integrated Anatomy and Physiology 2; HSL 1286, Nutrition; and two arts and sciences courses.
Quarter 6	ENG ____, middler year writing requirement; HSL 1500, Mental Health; and two arts and sciences courses.
Quarter 7	HSL 1506, Patterns of Community Health; HSL 1516, Drug Use and Abuse; and two arts and sciences courses.
Quarter 8	HSL 1503, Human Sexuality and Family Dynamics; HSL 1585, Teaching Procedures in Health Education in School and Community; and two arts and sciences courses.
Quarter 9	HSL 1501, Epidemiology; and three arts and sciences courses.
Quarter 10	HSL 1802 and HSL 1803, Supervised Student Teaching 1 and 2.
Quarter 11	HSL 1508, Senior Seminar; HSL 1510, Health Counseling; one elective; and two arts and sciences courses.

Specimen Program in Community Health Education

Quarter 1	CHM 1101, General Chemistry 1; ED 1100, Education and Social Science; ENG 1110, Freshman English 1; HSL 1254, First Aid; and HSL 1281, Current Issues in Health.
Quarter 2	BIO 1140, Basic Animal Biology 1; CHM 1102, General Chemistry 2; ED 1100, Education and Social Science or SOC ____ elective; HSL 1279, Foundation of Health Education; and one elective.

Quarter 3	BIO 1141, Basic Animal Biology 2; ENG 1111, Freshman English 2; HSL ____, skill elective; MTH 1106, Fundamentals of Mathematics; and PSY 1111, Foundation of Psychology 1.
Quarter 4	ED 1102, Human Development and Learning 1; HSL 1261, Anatomy and Physiology 1; HSL ____, skill elective; INT 1100, Beginning Computer Use; and PSY 1112, Foundations of Psychology 2.
Quarter 5	ED 1103, Human Development and Learning 2; ED 1306, Measurement and Evaluation; HSL 1285, Health Concerns of Youth; and HSL 1286, Nutrition.
Quarter 6	BIO 1120, Basic Microbiology; HSL 1500, Mental Health; one sociology elective; and one elective.
Quarter 7	HSL 1502, Communicable and Degenerative Diseases; HSL 1516, Drug Use and Abuse; HSL 1610, Anatomy and Physiology 2; and one elective.
Quarter 8	CRS 1200, Introduction to Special Education; HSL 1503, Human Sexuality and Family Dynamics; HSL 1585, Teaching Procedures in Health Education in School and Community; and one elective.
Quarter 9	HSL 1504, Longevity and Aging; HSL 1506, Patterns of Community Health; HSL 1507, Seminar 1; and two electives.
Quarter 10	HSL 1800 and HSL 1801, Supervised Field Experience 1 and 2; <i>or</i> HSL 1802 and HSL 1803, Supervised Student Teaching 1 and 2.
Quarter 11	ED ____, elective; HSL 1508, Seminar 2; HSL 1509, Organization and Administration of Health Education Programs; and HSL 1510, Health Counseling.

Specimen Program in Physical Therapy

Quarter 1	CHM 1111, General Chemistry 1; MTH 1106, Fundamentals of Mathematics; PSY 1111, Foundation of Psychology 1; and electives.
Quarter 2	BIO 1152, Integrated Human Anatomy and Physiology 1; CHM 1112, General Chemistry 2A; ENG 1110, Freshman English 1; PTH 1107, Cooperative Education in Physical Therapy; and electives.
Quarter 3	BIO 1153, Integrated Human Anatomy and Physiology 2; ENG 1111, Freshman English 2; MTH 1107, Functions and Basic Calculus; and electives.
Quarter 4	BIO 1154, Integrated Human Anatomy and Physiology 3; PHY 1201, Physics 1; PHY 1501, Physics 1 Lab; PTH 1118, Development Base of Human Performance; and one elective. (PTH 1114, Introduction to Physical Therapy 1; for transfers only.)
Quarter 5	PHY 1202, Physics 2; PSY 1112, Foundation of Psychology 2; PTH 1202, Therapeutic Modalities in Physical Therapy Practice; and two electives.
Quarter 6	PTH 1215, Physiology for Physical Therapists; PTH 1310, Clinical Gross Anatomy; PTH 1320, Physical Therapy 1; and PTH 1325, Clinical Medicine 1.
Quarter 7	ENG 1340, Writing Workshop; PTH 1330, Clinical Kinesiology; PTH 1335, Physical Therapy 2; PTH 1341, Musculoskeletal Therapeutic Exercise; PTH 1345, Clinical Medicine 2; and PTH 1352, Psychosocial Aspects of Illness.
Quarter 8	PTH 1356, Prosthetics; PTH 1361, Neurological Assessment and Adult Neurology; PTH 1366, Neuroanatomy; and PTH 1370, Clinical Seminar.
Quarter 9	PTH 1380, Supervised Clinical Education 1; PTH 1386, Pediatric Neurology; PTH 1391, Cardiopulmonary Rehabilitation in Physical Therapy; PTH 1392, Pathophysiology and Clinical Therapeutics; and PTH 1396, Pediatric Evaluation and Treatment.
Quarter 10	PTH 1400, Administration; PTH 1405, Research for Physical Therapy; PTH 1411, Physical Therapy 8; and two electives. Alternate: PTH 1415, Supervised Clinical Education 2.

Quarter 11	Alternate not taken in Quarter 10.
Quarter 12	PTH 1420, Physical Therapy in the Health Care System; PTH 1426, Functional Assessment of the Elderly Client; PTH 1453, Advanced Muscular Assessment and Treatment; and one elective.

Specimen Program in Human Services

Quarter 1	ED 1100, Education and Social Science, <i>or</i> SOC 1100, Introduction to Sociology; ENG 1110, Freshman English 1; POL 1111, Introduction to American Government, <i>or</i> another approved political science course; college distribution requirement.
Quarter 2	ED 1302, Introduction to Human Services Professions; ED 1102, Human Development 1 <i>or</i> PSY 1111, Foundations of Psychology 1; ENG 1111, Freshman English 2; and a social and communities issues course.
Quarter 3	ED 1103, Human Development 2, <i>or</i> PSY 1112, Foundations of Psychology 2; ECN 1116, Principles of Microeconomics, <i>or</i> another approved economics course; college distribution requirement; and a computer literacy course.

Bachelor of Science

Prerequisite courses. ED 1100, Education and Social Science, *or* SOC 1100, Introduction to Sociology; ED 1302, Introduction to Human Services Professions; ED 1102, Human Development 1 *or* PSY 1111, Foundations of Psychology 1; ED 1103 Human Development 2, *or* PSY 1112, Foundations of Psychology 2; POL 1111, Introduction to American Government, *or* another approved political science course; and ECN 1116, Principles of Microeconomics, *or* another approved economics course.

Core courses. ED 1307, Introduction to Educational Statistics, *or* SOC 1320, Introduction to Statistical Analysis *or* PSY 1211, Statistics in Behavioral Science 1; SOC 1324, Human Services Research and Evaluation, *or* PSY 1511, Experimental Design in Psychology, *or* SOC 1321, Research Methods 1; SOC 1240, Sociology of Human Services Organizations; PSY 1272, Personality 1; PSY 1373, Abnormal Psychology 1; CRS 1314, Introduction to Counseling; ED 1317, Seminar on Group Process, *or* SPC 1330, Interpersonal Communication 1, *or* SPC 1338, Group Discussion; CRS 1310, Intervention Strategies; and INT 1333, Senior Seminar in Human Services.

Social and community issues courses. Three courses focused on subjects such as poverty and welfare, minority affairs, special needs populations, and other contemporary American social problems, chosen with the student's academic adviser.

Human service fieldwork. INT 1336, Field Experience in Human Services 1; INT 1337, Field Experience in Human Services 2.

Human services specializations. Five courses in a particular subfield of human services, chosen with the student's academic adviser. Alternatives are grouped in three clusters: clinical, community, and administration.

University and college requirements. Computer literacy requirement; ENG 1110 and ENG 1111, Freshman English 1 and 2; middle year writing requirement; distribution requirements of four math/science and four humanities courses; eleven Boston-Bouvé College courses taken among those normally required to complete degree requirements.

Specialization in Deaf Studies

Prerequisite, core, and fieldwork courses follow the standard human services major.

Three social and community issues courses, selected from the subjects suggested above, and/or from the following. PSY 1271, Social Psychology, *or* SOC 1135, Social Psychology; SOA 1135, Language and Culture; SOA 1101, Culture, Meaning, and Everyday Experience; ENG 1118, Introduction to Language; PSY 1263, Body Language; SOC 1140, Sociology of Prejudice; SPC 1232, Communication and Gender; CRS 1314, Introduction to Counseling. *Deaf studies specialization.* ASL 1101, American Sign Language 1; ASL 1102, American Sign Language 2; ASL 1201, Intermediate American Sign Language 1; ASL 1202, Intermediate American Sign Language 2; and one to five courses selected from: ASL 1211, Deaf Culture; ASL 1212, Deaf History; PSY 1363, American Sign Language Linguistics; PSY 1261, Bilingualism; SLA 1101, Introduction to Speech and Hearing; and ASL 1401, American Sign Language Literature.

Education Programs

Early Childhood Education Elementary Education and High School Teacher Certification

General requirements.

1. Effective October 1, 1994, all students seeking teaching certificates in Massachusetts at any grade level (K–12) will need a degree that consists of both a major in the arts and sciences and a program of study in education. Arts and sciences majors are available only in the College of Arts and Sciences; programs in education are available through the Boston-Bouvé College of Human Development Professions.
2. Students who wish to obtain certification as an early childhood education teacher or an elementary education teacher should enroll in the Boston-Bouvé College dual-major program. These students will be assigned advisers from both Boston-Bouvé and the College of Arts and Sciences. Advisers help the student plan an appropriate education/arts and sciences dual major. The dual major includes a major in education, a major in the arts and sciences, and distribution requirements. Specimen dual major programs are available in 54 Lake Hall.
3. Students who wish to obtain high school teacher certification should enroll in the College of Arts and Sciences and select an appropriate major. Students should also select a minor in education. The requirements of the education minor can be obtained in 54 Lake Hall.

College of Business Administration

Specimen Program for First Three Quarters

The courses taken in the first three quarters are the same for all concentrations.

Quarter 1	ECN 1115, Principles of Macroeconomics; ENG 1110, Freshman English 1; and two arts and sciences electives.
Quarter 2	ECN 1116, Principles of Microeconomics; MTH 1114, Calculus for Business; and two arts and sciences electives.
Quarter 3	ENG 1111, Freshman English 2; MGT 1115, Introduction to Business; and two arts and sciences electives.

Accounting

Quarter 4	ACC 1111, Accounting Principles 1; MSC 1200, Business Statistics 1; MSC 1226, Introduction to Data Processing; and one nonbusiness elective.
Quarter 5	ACC 1112, Accounting Principles 2; MSC 1201, Business Statistics 2; and two nonbusiness electives.
Quarter 6	ACC 1331, Intermediate Accounting 1; FIN 1438, Principles of Finance 1; and HRM 1433, Organizational Behavior and Design.
Quarter 7	ACC 1332, Intermediate Accounting 2; ACC 1339, Cost Accounting 1; FIN 1439, Principles of Finance 2; and MKT 1435, Introduction to Marketing.
Quarter 8	ACC 1343, Intermediate Accounting 3; ACC 1345, Accounting Systems; MSC 1441, Operations Management; and one nonbusiness elective.
Quarter 9	ACC 1347, Auditing; MSC 1433, Quantitative Models in Business; MGT 1446, Managing Social Issues; and upper division writing requirement.
Quarter 10	ACC 1351, Federal Income Tax 1; MGT 1450, Business Policy; and two open electives.
Quarter 11	Three open electives; and a nonbusiness elective.

Entrepreneurship and New Venture Management

Quarter 4	ACC 1111, Accounting Principles 1; MSC 1200, Business Statistics 1; MSC 1226, Introduction to Data Processing; and one nonbusiness elective.
Quarter 5	ACC 1112, Accounting Principles 2; MSC 1201, Business Statistics 2; and two nonbusiness electives.
Quarter 6	ENT 1330, Management of Smaller Enterprises; FIN 1438, Principles of Finance 1; MKT 1435, Introduction to Marketing; and open elective.
Quarter 7	FIN 1439, Principles of Finance 2; HRM 1433, Organizational Behavior and Design; and MSC 1433, Quantitative Models in Business.
Quarter 8	ENT 1344, Opportunity Analysis and Venture Capital; a nonbusiness elective; an open elective; and upper division writing requirement.
Quarter 9	FIN 1770, Small Business Finance; MGT 1446, Managing Social Issues; MSC 1441, Operations Management; and an open elective.
Quarter 10	MGT 1450, Business Policy; ENT 1352, New Venture Creation; a nonbusiness elective; and an open elective.
Quarter 11	ENT 1358, Small Business Institute Field Project; and two open electives.

Finance and Insurance

Quarter 4	ACC 1111, Accounting Principles 1; MSC 1200, Business Statistics 1; and two nonbusiness electives.
Quarter 5	ACC 1112, Accounting Principles 2; MSC 1201, Business Statistics 2; MSC 1226, Introduction to Data Processing; and a nonbusiness elective.
Quarter 6	FIN 1438, Introduction to Finance; FIN 1333, Financial Institutions and Markets; MKT 1435, Introduction to Marketing; and a nonbusiness elective.
Quarter 7	FIN 1439, Principles of Finance 2; HRM 1433, Organizational Behavior and Design; and MSC 1433, Quantitative Models in Business.
Quarter 8	FIN 1335, Managerial Finance; FIN 1346, Investment Management; upper-division writing requirement; and an open elective.
Quarter 9	MSC 1441, Operations Management; MGT 1446, Managing Social Issues; Finance elective; and an open elective.
Quarter 10	MGT 1450, Business Policy; Finance elective; and two open electives.
Quarter 11	Finance elective; and three open electives.

Human Resources Management

Quarter 4	ACC 1111, Accounting Principles 1; MSC 1200, Business Statistics 1; MSC 1226, Introduction to Data Processing; and one nonbusiness elective.
Quarter 5	ACC 1112, Accounting Principles 2; MSC 1201, Business Statistics 2; and two nonbusiness electives.
Quarter 6	FIN 1438, Principles of Finance 1; HRM 1433, Organizational Behavior and Design; and MSC 1433, Quantitative Models in Business.
Quarter 7	FIN 1439, Principles of Finance 2; HRM 1332, Introduction to Human Resource Management; MKT 1435, Introduction to Marketing; and an open elective.
Quarter 8	HRM 1348, Reward Systems; HRM 1349, Assessment of Prospective Employees; MSC 1441, Operations Management; and an open elective.
Quarter 9	MGT 1446, Managing Social Issues; Human Resources Management elective; upper division writing requirement; and an open elective.
Quarter 10	HRM 1345, Contemporary Labor Issues; MGT 1450, Business Policy; Human Resources Management elective; and an open elective.
Quarter 11	Nonbusiness elective; and three open electives.

International Business Administration

Quarter 4	ACC 1111, Accounting Principles 1; MSC 1200, Business Statistics 1; and two nonbusiness electives.
Quarter 5	ACC 1112, Accounting Principles 2; MSC 1201, Business Statistics 2; MSC 1226, Introduction to Data Processing; and one nonbusiness elective.
Quarter 6	FIN 1438, Introduction to Finance; HRM 1433, Organizational Behavior and Design; and INB 1338, Introduction to International Business.
Quarter 7	FIN 1439, Principles of Finance 2; FIN 1759, International Financial Markets; MKT 1435, Introduction to Marketing; and MSC 1433, Quantitative Models in Business.
Quarter 8	MSC 1441, Operations Management; a business elective; an international nonbusiness elective; and an open elective.
Quarter 9	MGT 1446, Managing Social Issues; upper division writing requirement; an international business elective; and an open elective.
Quarter 10	MGT 1450, Business Policy; an international nonbusiness elective; and two open electives.
Quarter 11	INB 1352, Seminar in International Business; an international business elective; and two open electives.

Management

Quarter 4	ACC 1111, Accounting Principles 1; MSC 1200, Business Statistics 1; and two nonbusiness electives.
Quarter 5	ACC 1112, Accounting Principles 2; MSC 1201, Business Statistics 2; MSC 1226, Introduction to Data Processing; and a nonbusiness elective.
Quarter 6	FIN 1438, Introduction to Finance; HRM 1433, Organizational Behavior and Design; and MSC 1433, Quantitative Models in Business.
Quarter 7	ACC 1330, Cost Accounting; FIN 1439, Principles of Finance 2; HRM 1332, Introduction to Human Resource Management; and MKT 1435, Introduction to Marketing.
Quarter 8	MGT 1345, Legal Aspects of Business; MSC 1441, Operations Management; a business elective; and an open elective.
Quarter 9	MGT 1446, Managing Social Issues; a business elective; an open elective; and upper division writing requirement.
Quarter 10	MGT 1450, Business Policy; a nonbusiness elective; and two open electives.
Quarter 11	Business elective and three open electives.

Management Information Systems

Quarter 4	ACC 1111, Accounting Principles 1; MSC 1200, Business Statistics 1; and two nonbusiness electives.
Quarter 5	ACC 1112, Accounting Principles 2; MSC 1201, Business Statistics 2; MSC 1226, Introduction to Data Processing; and a nonbusiness elective.
Quarter 6	FIN 1438, Introduction to Finance; HRM 1433, Organizational Behavior and Design; and MSC 1331, End User Computing.
Quarter 7	FIN 1439, Principles of Finance 2; MKT 1435, Introduction to Marketing; MSC 1339, Business Programming 1; and MSC 1433, Quantitative Modeling.
Quarter 8	MSC 1441, Operations Management; MSC 1340, Business Programming 2; a nonbusiness elective; and an open elective.
Quarter 9	MGT 1446, Managing Social Issues; MSC 1349, Systems Analysis and Design; upper division writing requirement; and a nonbusiness elective.

Quarter 10 MGT 1450, Business Policy; MSC 1350, Database Management Systems; and two open electives.

Quarter 11 MSC 1351, Management Information Systems; and three open electives.

Marketing

Quarter 4 ACC 1111, Accounting Principles 1; MSC 1200, Business Statistics 1; MSC 1226, Introduction to Data Processing; and a nonbusiness elective.

Quarter 5 ACC 1112, Accounting Principles 2; MSC 1201, Business Statistics 2; and two nonbusiness electives.

Quarter 6 FIN 1438, Principles of Finance 1; MKT 1435, Introduction to Marketing; MSC 1433, Quantitative Models in Business; and an open elective.

Quarter 7 FIN 1439, Principles of Finance 2; HRM 1433, Organizational Behavior and Design; and MKT 1331, Marketing Management.

Quarter 8 MKT 1341, Marketing Research; a marketing elective; an open elective; and upper division writing requirement.

Quarter 9 MGT 1446, Managing Social Issues; MSC 1441, Operations Management; a marketing elective; and an open elective.

Quarter 10 MKT 1351, Competitive Strategies; MGT 1450, Business Policy; and two open electives.

Quarter 11 Marketing elective; and three open electives.

Transportation and Logistics Management

Quarter 4 ACC 1111, Accounting Principles 1; MSC 1200, Business Statistics 1; and two nonbusiness electives.

Quarter 5 ACC 1112, Accounting Principles 2; MSC 1201, Business Statistics 2; MSC 1226, Introduction to Data Processing; and a nonbusiness elective.

Quarter 6 FIN 1438, Introduction to Finance; HRM 1433, Organizational Behavior and Design; and TRN 1333, The Domestic Transportation System.

Quarter 7 FIN 1439, Principles of Finance 2; a transportation elective; MKT 1435, Introduction to Marketing; and MSC 1433, Quantitative Models in Business.

Quarter 8 MSC 1441, Operations Management; a transportation elective; a nonbusiness elective; and an open elective.

Quarter 9 MGT 1446, Managing Social Issues; TRN 1344, Corporate Transportation/Logistics; an open elective; and upper division writing requirement.

Quarter 10 MGT 1450, Business Policy; a transportation elective; and two open electives.

Quarter 11 TRN 1353, Seminar in Transportation and Logistics; and three open electives.

College of Computer Science

Specimen Program for the Five-Year Computer Science BS Program

Quarter 1 COM 1100, Fundamentals of Computer Science; COM 1121, Computer Science Overview 1; ENG 1110, Freshman English 1; MTH 1123, Calculus 1; and one basic social science.

Quarter 2 COM 1101, Algorithms and Data Structures 1; COM 1122, Computer Science Overview 2; MTH 1124, Calculus 2; MTH 1137, Discrete Mathematics 1; and one basic social science.

Quarter 3 COM 1110, FORTRAN Lab; COM 1201, Algorithms and Data Structures 2; ENG 1111, Freshman English 2; MTH 1125, Calculus 3; and one sub-area or general elective.

Quarter 4	COM 1130, Computer Organization and Programming 1; MTH 1223, Calculus 4; PHY 1231, Physics 1; PHY 1531, Physics 1 Lab; and one sub-area or general elective.
Quarter 5	COM 1114, C Lab; COM 1131, Computer Organization and Programming 2; MTH 1237, Discrete Mathematics 2; PHY 1232, Physics 2; PHY 1532, Physics 2 Lab; and one sub-area or general elective.
Quarter 6	COM 1330, Systems Programming; ECE 1229, Digital Systems Lab; ECE 1382, Computer Engineering 2; PHY 1233, Physics 3; and one sub-area or general elective.
Quarter 7	COM 1102, Functional Programming and Applications; COM 1350, Automata and Formal Language; ENG 1125, Technical Writing 1; and one sub-area or general elective.
Quarter 8	COM 1310, File Structures; MTH 1301, Linear Algebra 1; SOC 1485, Computers and Society; and one computer science elective.
Quarter 9	COM 1205, Software Design and Development; MTH 1387, Probability 1; one computer science elective; and one sub-area or general elective.
Quarter 10	Two computer science electives and two sub-area or general electives.
Quarter 11	COM 1621, Computer Science Seminar; one computer science elective; and three sub-area or general electives.

Specimen Program for the Four-Year Computer Science BS Program

Quarter 1	COM 1100, Fundamentals of Computer Science; COM 1121, Computer Science Overview 1; ENG 1110, Freshman English 1; MTH 1123, Calculus 1; and one basic social science.
Quarter 2	COM 1101, Algorithms and Data Structures 1; COM 1122, Computer Science Overview 2; MTH 1124, Calculus 2; MTH 1137, Discrete Mathematics 1; and one basic social science.
Quarter 3	COM 1110, FORTRAN Lab; COM 1201, Algorithms and Data Structures 2; ENG 1111, Freshman English 2; MTH 1125, Calculus 3; and one sub-area or general elective.
Quarter 4	COM 1130, Computer Organization and Programming 1; MTH 1223, Calculus 4; PHY 1231, Physics 1; PHY 1521, Physics 1 Lab; and one sub-area or general elective.
Quarter 5	COM 1131, Computer Organization and Programming 2; MTH 1237, Discrete Mathematics 2; PHY 1232, Physics 2; PHY 1522, Physics 2 Lab; and one sub-area or general elective.
Quarter 6	COM 1114, C Lab; COM 1350, Automata and Formal Language; MTH 1387, Probability; and two sub-area or general electives.
Quarter 7	COM 1330, Systems Programming; ECE 1229, Digital Systems Lab; ECE 1382, Computer Engineering 2; PHY 1233, Physics 3; and one sub-area or general elective.
Quarter 8	COM 1102, Functional Programming and Applications; COM 1350, Automata and Formal Language; ENG 1125, Technical Writing 1; one computer science elective; and one sub-area or general elective.
Quarter 9	COM 1205, Software Design and Development; MTH 1301, Linear Algebra; one computer science elective; and one sub-area or general elective.
Quarter 10	COM 1310, File Structures; SOC 1485, Computers and Society; one computer science elective; and one sub-area or general elective.
Quarter 11	COM 1621, Senior Seminar; two computer science electives; and two sub-area or general electives.

Specimen Program for the Five-Year Computer Science BA Program with Computer Science Courses Starting in the First Year

Quarter 1	COM 1100, Fundamentals of Computer Science; COM 1121, Computer Science Overview 1; ENG 1110, Freshman English 1; MTH 1123, Calculus 1; and one arts and sciences elective.
Quarter 2	COM 1101, Algorithms and Data Structures 1; COM 1122, Computer Science Overview 2; MTH 1124, Calculus 2; MTH 1137, Discrete Mathematics 1; and one arts and sciences elective.
Quarter 3	COM 1201, Algorithms and Data Structures 2; ENG 1111, Freshman English 2; MTH 1125, Calculus 3; and one general elective.
Quarter 4	COM 1130, Computer Organization and Programming 1; one general elective; one science elective; and one arts and sciences elective.
Quarter 5	COM 1102, Functional Programming and Applications; COM 1114, C Lab; COM 1350, Automata and Formal Languages; MTH 1237, Discrete Mathematics 2; and one science elective.
Quarter 6	COM 1390, Analysis of Algorithms; one general elective; one science elective; and one arts and sciences elective.
Quarter 7	COM 1358, Analysis of Programming Languages; ENG ____, middler year writing requirement; and two arts and sciences electives.
Quarter 8	MTH 1301, Linear Algebra 1; SOC 1485, Computers and Society; one computer science elective; and one arts and sciences elective.
Quarter 9	One computer science elective; one general elective; and two arts and sciences electives.
Quarter 10	One computer science elective; two general electives; and one arts and sciences elective.
Quarter 11	COM 1621, Computer Science Seminar; one computer science elective; two general electives; and one arts and sciences elective.

Specimen Program for the Five-Year Computer Science BA Program with Computer Science Courses Starting in the Second Year

Quarter 1	ENG 1110, Freshman English 1; MTH 1123, Calculus 1; one science elective; and one arts and sciences elective.
Quarter 2	MTH 1124, Calculus 2; one general elective; one science elective; and one arts and sciences elective.
Quarter 3	ENG 1111, Freshman English 2; MTH 1125, Calculus 3; one general elective; and one science elective.
Quarter 4	COM 1110, Fundamentals of Computer Science; COM 1121, Computer Science Overview 1; MTH 1137, Discrete Mathematics 1; and two arts and sciences electives.
Quarter 5	COM 1101, Algorithms and Data Structures 1; COM 1222, Computer Science Overview 2; MTH 1237, Discrete Mathematics 2; and two arts and sciences electives.
Quarter 6	COM 1201, Algorithms and Data Structures 2; COM 1130, Computer Organization and Programming 1; one general elective; and one arts and sciences elective.
Quarter 7	COM 1102, Functional Programming and Applications; COM 1114, C Lab; COM 1350, Automata and Formal Language; ENG ____, middler year writing requirement; one arts and sciences elective.
Quarter 8	COM 1390, Analysis of Algorithms; MTH 1301, Linear Algebra; SOC 1485, Computers and Society; one general elective.

Quarter 9	COM 1358, Analysis of Programming Languages; one computer science elective; one general elective; one arts and sciences elective.
Quarter 10	Two computer science electives; one general elective; one arts and sciences elective.
Quarter 11	COM 1621, Computer Science Seminar; one computer science elective; two general electives; one arts and sciences elective.

Specimen Program for the Four-Year Computer Science BA Program

Quarter 1	COM 1100, Fundamentals of Computer Science; COM 1121, Computer Science Overview 1; ENG 1110, Freshman English 1; MTH 1123, Calculus 1; one arts and sciences core course.
Quarter 2	COM 1101, Algorithms and Data Structure 1; COM 1122, Computer Science Overview 2; MTH 1124, Calculus 2; MTH 1137, Discrete Mathematics 1; one arts and sciences core course.
Quarter 3	COM 1201, Algorithms and Data Structure 2; ENG 1111, Freshman English 2; MTH 1125, Calculus 3; and one general elective.
Quarter 4	COM 1130, Computer Organization and Programming 1; one science course; and two arts and sciences core courses.
Quarter 5	COM 1102, Functional Programming and Applications; COM 1114, C Lab; COM 1350, Automata and Formal Languages; MTH 1237, Discrete Mathematics 2; and one science course.
Quarter 6	COM 1390, Analysis of Algorithms; one general elective; and two arts and sciences core courses.
Quarter 7	COM 1358, Analysis of Programming Languages; MTH 1301, Linear Algebra; SOC 1485, Computers and Society; and one science course.
Quarter 8	ENG ____, middle year writing requirement; one computer science elective; one general elective; one arts and sciences core course.
Quarter 9	One computer science elective; one general elective; and two arts and sciences core courses.
Quarter 10	One computer science elective; two general electives; and one arts and sciences core course.
Quarter 11	One senior seminar; one computer science elective; two general electives; one arts and sciences core course.

College of Criminal Justice

Specimen Program in Criminal Justice

Quarter 1	CJ 1101, Administration of Criminal Justice; HST 1101, Western Civilization to 1648; POL 1110, Introduction to Politics; and PSY 1111, Foundations of Psychology 1.
Quarter 2	CJ 1112, Critical Issues in Criminal Justice; ENG 1110, Freshman English 1; HST 1102, Western Civilization Since 1648; and POL 1111, Introduction to American Government.
Quarter 3	CJ 1151, Introduction to Law and Legal Process 1; ENG 1111, Freshman English 2; PSY 1112, Foundation of Psychology 2; and SOC 1100, Introduction to Sociology.
Quarter 4	CJ 1201, Criminology; CJ 1251, Introduction to Criminal Law; POL 1318, State and Local Government; and one math/science requirement.
Quarter 5	CJ 1252, Criminal Due Process; one criminal justice elective; one math/science requirement; and one non-criminal justice elective.
Quarter 6	CJ 1451, Criminal Justice Research; ECN 1115, Principles of Macroeconomics; ENG 1350, Intermediate Writing; and one criminal justice elective.

Quarter 7	ECN 1116, Principles of Microeconomics; one criminal justice elective; and two non-criminal justice electives.
Quarter 8–11	24 QH of criminal justice electives and 36 QH of non-criminal justice electives.

College of Engineering

Specimen Program for First Three Quarters

Students in full-time engineering degree programs take the following courses in the first three quarters.

Quarter 1	ENG 1111, Freshman English 2; GE 1100, Computers for Engineers; MTH 1123, Calculus 1; PHY 1221, Physics 1; and PHY 1521, Physics 1 Lab.
Quarter 2	CHM 1131, General Chemistry 1; GE 1110, Engineering Graphics and Design; MTH 1124, Calculus 2; PHY 1222, Physics 2; and PHY 1522, Physics 2 Lab.
Quarter 3	CHM 1132, General Chemistry 2; CHM 1138, General Chemistry Lab; ENG 1113, Great Themes in Literature; MTH 1125, Calculus 3; and PHY 1223, Physics 3.

Specimen Program in Chemical Engineering

Quarters 1–3	See above.
Quarter 4	CHE 1201, Chemical Engineering Calculations 1; CHE 1205, Computation Lab; CHM 1271, Organic Chemistry 1; MTH 1223, Calculus 4; and one social science/humanities elective.
Quarter 5	CHE 1202, Chemical Engineering Calculations 2; CHM 1272, Organic Chemistry 2 with Lab; MTH 1225, Mathematical Analysis 1; and one social science/humanities elective.
Quarter 6	CHE 1211, Chemical Engineering Thermodynamics 1; CHM 1381, Physical Chemistry 1; CHM 1394, Experimental Physical Chemistry 1; MTH 1230, Linear Algebra; and one social science/humanities elective.
Quarter 7	CHE 1310, Chemical Engineering Thermodynamics 2; CHE 1320, Momentum Transport; CHM 1382, Physical Chemistry 2; CHM 1395, Experimental Physical Chemistry 2; and ENG 1125, Technical Writing 1.
Quarter 8	CHE 1410, Experimental Methods 1; CHE 1421, Chemical Engineering Kinetics; CHE 1430, Heat Transport; and ECN 1115, Principles of Macroeconomics.
Quarter 9	CHE 1411, Experimental Methods 2; CHE 1440, Separation Processes; CHE 1450, Chemical Engineering Economics; and one social science/humanities elective.
Quarter 10	CHE 1501, Process Design 1; CHE 1512, Chemical Process Control; one chemical engineering elective; and one advanced chemical engineering elective.
Quarter 11 (Spring only)	CHE 1502, Process Design 2; two chemical engineering electives; and one engineering elective.

Specimen Program in Civil Engineering

Quarters 1–3	See above.
Quarter 4	CIV 1210, Structural Mechanics 1; CIV 1510, Materials; CIV 1511, Materials Lab; MTH 1223, Calculus 4; and one social science/humanities elective.
Quarter 5	CIV 1211, Structural Mechanics 2; CIV 1620, Engineering Measurements; CIV 1621, Engineering Measurements Lab; ECN 1116, Principles of Microeconomics; and MTH 1225, Mathematical Analysis 1.
Quarter 6	CIV 1220, Structural Analysis 1; CIV 1226, Structural Design and Analysis Lab; CIV 1310, Fluid Mechanics; MTH 1230, Linear Algebra; and one social science/humanities elective.

Quarter 7	CIV 1240, Design of Reinforced Concrete Structures 1; CIV 1340, Environmental Engineering 1; CIV 1410, Soil Mechanics; CIV 1411, Soil Mechanics Lab; and ENG 1125, Technical Writing 1.
Quarter 8	CIV 1250, Design of Steel Structures 1; CIV 1625, Civil Engineering Computations Lab; CIV 1640, Applied Probability and Theory of Civil Engineering; and two technical electives.
Quarter 9	CIV 1665, Professional Issues for Civil Engineers; IIS 1366, Engineering Economy; ME 1320, Dynamics for Civil Engineers; and two technical electives.
Quarter 10	Two technical electives; one social science/humanities elective; and one technical or capstone elective.
Quarter 11	One general elective; one technical elective; one technical or capstone elective; and one social science/humanities elective.

Specimen Program for the Part-Time Evening Civil Engineering BS Program

First Year

Fall Quarter	GE 1100, Computers for Engineers and MTH 1123, Calculus 1.
Winter Quarter	CHM 1131, Chemistry 1; COM 1110, FORTRAN Lab; and MTH 1124, Calculus 2.
Spring Quarter	CHM 1132, Chemistry 2 and MTH 1125, Calculus 3.

Second Year

Fall Quarter	MTH 1223, Calculus 4; PHY 1221, Physics 1; and PHY 1521, Physics 1 Lab.
Winter Quarter	MTH 1225, Mathematical Analysis 1; PHY 1222, Physics 2; and PHY 1522, Physics 2 Lab.
Spring Quarter	GE 1110, Engineering Graphics and Design and PHY 1223, Physics 3.

Third Year

Fall Quarter	CIV 1210, Structural Mechanics 1 and CIV 1620, Engineering Measurements.
Winter Quarter	CIV 1211, Structural Mechanics 2 and MTH 1230, Linear Algebra.
Spring Quarter	CIV 1410, Soil Mechanics; CIV 1411, Soil Mechanics Lab; and ENG 1125, Technical Writing 1.

Fourth Year

Fall Quarter	CIV 1220, Structural Analysis 1; CIV 1226, Structural Analysis and Design Lab; and CIV 1310, Fluid Mechanics.
Winter Quarter	CIV 1240, Design of Reinforced Concrete Structures 1 and CIV 1340, Environmental Engineering 1.
Spring Quarter	CIV 1250, Design of Steel Structures 1; CIV 1625, Civil Computations Lab; and CIV 1640, Applied Probability Theory for Engineers.

Fifth Year

Fall Quarter	CIV 1241, Design of Reinforced Concrete Structures 2 or CIV 1341, Environmental Engineering 2; and a general elective.
Winter Quarter	IIS 1366, Engineering Economy and ME 1320, Dynamics for Civil Engineers.
Spring Quarter	CIV 1510, Materials; CIV 1511, Materials Lab; and CIV 1540, Highway Engineering or CIV 1550, Construction Management.

Sixth Year (Odd)

Fall Quarter	CIV 1341, Environmental Engineering 2 and CIV 1420, Foundation Engineering.
Winter Quarter	CIV 1320, Hydraulic Engineering and CIV 1350, Environmental and Hydraulics Lab.
Spring Quarter	CIV 1395, Environmental Design Projects and CIV 1540, Highway Engineering.

Sixth Year (Even)

Fall Quarter	CIV 1241, Design of Reinforced Concrete Structures 2 and CIV 1420, Foundation Engineering.
Winter Quarter	CIV 1222, Structural Analysis 2 and CIV 1251, Design of Steel Structures 2.
Spring Quarter	CIV 1295, Structural Design Projects and CIV 1550, Construction Management.

Specimen Program in Computer Engineering

Quarter 1–3	See page 32.
Quarter 4	ECE 1215, Circuits and Systems 1; ECE 1221, Measurements Lab; MTH 1223, Calculus 4; PHY 1224, Physics 4; and one social science/humanities elective.
Quarter 5	ECE 1216, Circuits and Systems 2; ECE 1222, Circuits Lab 1; ME 1321, Mechanics for Electrical Engineers; MTH 1225, Mathematical Analysis 1; and one social science/humanities elective.
Quarter 6	ECE 1217, Circuits and Systems 3; ECE 1223, Circuits Lab 2; ECE 1346, Electronics 1; ECE 1381, Computer Engineering 1; and ME 1340, Thermodynamics or ME 1386, Materials Science.
Quarter 7	ECE 1224, Electronics Lab 1; ECE 1229, Digital Systems Lab; ECE 1332, Linear Systems 1; ECE 1347, Electronics 2; ECE 1382, Computer Engineering 2; and ENG 1125, Technical Writing 1.
Quarter 8	ECE 1225, Electronics Lab 2; ECE 1226, Discrete Systems Lab; ECE 1333, Linear Systems 2; ECE 1349, Electronic Design 1; ECE 1363, Electromagnetic Field Theory 1; ECE 1383, Computer Engineering 3; and one social science/humanities elective.
Quarter 9	ECE 1227, Electromagnetic Fields Lab 1; ECE 1364, Electromagnetic Field Theory 2; ECE 1384, Computer Engineering 4; MTH 1384, Probability; and one social science/humanities elective.
Quarter 10	ECE 1228, Electromagnetic Fields Lab 2; ECE 1230, VLSI Systems Design Lab; ECE 1351, Topics in IC Design; ECE 1365, Electromagnetic Fields and Energy Conversion 2; and one social science/humanities elective.
Quarter 11	Three technical electives and one social science/humanities elective.

Specimen Program in Electrical Engineering

Quarters 1–3	See page 32.
Quarter 4	ECE 1215, Circuits and Systems 1; ECE 1221, Measurements Lab; MTH 1223, Calculus 4; PHY 1224, Physics 4; and one social science/humanities elective.
Quarter 5	ECE 1216, Circuits and Systems 2; ECE 1222, Circuits Lab 1; ME 1321, Mechanics for Electrical Engineers; MTH 1225, Mathematical Analysis 1; and one social science/humanities elective.
Quarter 6	ECE 1217, Circuits and Systems 3; ECE 1346, Electronics 1; ECE 1381, Computer Engineering 1; ME 1340, Thermodynamics 1 or ECE 1223, Circuits Lab 2; and ME 1386, Materials Science.
Quarter 7	ECE 1224, Electronics Lab 1; ECE 1229, Digital Systems Lab; ECE 1332, Linear Systems 1; ECE 1347, Electronics 2; ECE 1382, Computer Engineering 2; and ENG 1125, Technical Writing.

Quarter 8	ECE 1225, Electronics Lab 2; ECE 1226, Discrete Systems Lab; ECE 1333, Linear Systems 2; ECE 1349, Electronic Design 1; ECE 1363, Electromagnetic Field and Theory 1; and ECE 1383, Computer Engineering 3.
Quarter 9	ECE 1227, Electromagnetic Fields Lab 1; ECE 1364, Electromagnetic Fields Theory 2; MTH 1384, Probability for Engineering; one social science/humanities elective; and one technical elective.
Quarter 10	ECE 1228, Electromagnetic Fields Lab 2; ECE 1365, Electromagnetic Fields and Energy Conversion; ECE 1454, Communication Systems; one social science/humanities elective; and one technical elective.
Quarter 11	ECE 1408, Physical Electronics <i>or</i> ECE 1420, Control Systems <i>or</i> ECE 1465, Wave Transmission and Reception; one social science/humanities elective; and two technical electives.

Specimen Program in Power Systems

Quarters 1–3	See page 32.
Quarter 4	ECE 1215, Circuits and Systems 1; ECE 1221, Measurements Lab; MTH 1223, Calculus 4; PHY 1224, Physics 4; and one social science/humanities elective.
Quarter 5	ECE 1216, Circuits and Systems 2; ECE 1222, Circuits Lab 1; ME 1321, Mechanics for Electrical Engineers; MTH 1225, Mathematical Analysis 1; and one social science/humanities elective.
Quarter 6	ECE 1217, Circuits and Systems 3; ECE 1223, Circuits Lab 2; ECE 1346, Electronics 1; ECE 1381, Computer Engineering 1; and ME 1360, Thermodynamics 1.
Quarter 7	ECE 1224, Electronics Lab 1; ECE 1229, Digital Systems Lab; ECE 1332, Linear Systems 1; ECE 1347, Electronics 2; ECE 1382, Computer Engineering 2; and ENG 1125, Technical Writing.
Quarter 8 (Fall only)	ECE 1225, Electronics Lab 2; ECE 1226, Discrete Systems Lab; ECE 1333, Linear Systems 2; ECE 1349, Electronic Design 1; ECE 1363, Electromagnetic Field Theory 1; and one social science/humanities elective.
Quarter 9 (Spring only)	ECE 1227, Electromagnetic Fields Lab 1; ECE 1364, Electromagnetic Fields Theory 2; ECE 1471, Electrical Power Systems 1; MTH 1384, Probability for Engineering; and one social science/humanities elective.
Quarter 10 (Winter only)	ECE 1228, Electromagnetic Fields Lab 2; ECE 1231, Electrical Power Lab 1; ECE 1365, Electromagnetic Fields and Energy Conversion; ECE 1472, Electrical Power Systems 2; one social science/humanities elective; and one technical elective.
Quarter 11 (Spring only)	ECE 1232, Electrical Power Lab 2; ECE 1371, Electrical Machines 1; ECE 1379, Transients in Electrical Power Systems; ECE 1474, Power Electronics; and one technical elective.

Specimen Program for the Part-Time BS Evening Program in Electrical and Computer Engineering

First Year

Fall Quarter	GE 1100, Computer for Engineers and MTH 1123, Calculus 1.
Winter Quarter	CHM 1131, Chemistry 1; COM 1110, FORTRAN Lab; and MTH 1124, Calculus 2.
Spring Quarter	CHM 1132, Chemistry 2 and MTH 1125, Calculus 3.

Second Year

Fall Quarter	MTH 1223, Calculus 4; PHY 1221, Physics 1; and PHY 1521, Physics 1 Lab.
Winter Quarter	MTH 1225, Mathematical Analysis 1; PHY 1222, Physics 2; and PHY 1522, Physics 2 Lab.
Spring Quarter	GE 1110, Engineering Graphics and Design and PHY 1223, Physics 3.

Third Year

Fall Quarter	ECE 1215, Circuits and Systems 1; ECE 1221, Measurements Lab; and PHY 1224, Physics 4.
Winter Quarter	ECE 1216, Circuits and Systems 2; ECE 1222, Circuits Lab 1; and ME 1321, Mechanics for Electrical Engineers.
Spring Quarter	ECE 1217, Circuits and Systems 3; ECE 1223, Circuits Lab 2; and MTH 1384, Probability.

Fourth Year

Fall Quarter	ECE 1332, Linear Systems 1 and ECE 1346, Electronics 1.
Winter Quarter	ECE 1224, Electronics Lab 1; ECE 1226, Discrete Systems Lab 1; ECE 1333, Linear System 2; and ECE 1347, Electronics 2.
Spring Quarter	ECE 1225, Electronics Lab 2; ECE 1349, Electronic Design 1; and ME 1340, Thermodynamics 1 or ME 1386, Materials Science.

Fifth Year

Fall Quarter	ECE 1363, Electromagnetic Field Theory 1 and ECE 1381, Computer Engineering 1.
Winter Quarter	ECE 1227, Electromagnetic Fields Lab; ECE 1229, Digital Systems Lab; ECE 1364, Electromagnetic Fields Theory 2; and ECE 1382, Computer Engineering 2.
Spring Quarter	ECE 1228, Electromagnetic Fields and Energy Conservation Lab 2; ECE 1365, Electromagnetic Fields and Energy Conservation; and ECE 1383, Computer Engineering 3.

Sixth Year

Fall Quarter	<i>Choose two technical electives from the following.</i> ECE 1230, VLSI System Design Lab; ECE 1235, Control Systems Lab; ECE 1351, Special Topics IC Design; ECE 1408, Physical Electronics; ECE 1420, Control Systems; ECE 1454, Communication Systems; and ECE 1486, Numerical Methods and Computer Applications.
Winter Quarter	<i>Choose two technical electives from the following.</i> ECE 1230, VLSI System Design Lab; ECE 1235, Control Systems Lab; ECE 1351, Special Topics IC Design; ECE 1384, Computer Engineering 4; ECE 1420, Control Systems; ECE 1471, Electrical Power Systems 1; and MTH 1351, Functions of a Complex Variable.
Spring Quarter	ECE 1454, Communication Systems and choose one technical elective from the following. ECE 1234, Digital Signal Processing Lab; ECE 1456, Digital Signal Processing; ECE 1465, Wave Transmission and Reception; and MTH 1301, Linear Algebra.

Specimen Program in General Engineering

Quarters 1–3	See page 32.
Quarter 4	MTH 1223, Calculus 4; one basic science elective; one engineering science elective; and one social science/humanities elective.
Quarter 5	MTH 1225, Mathematical Analysis 1; one engineering science elective; one coordinated study elective; and one social science/humanities elective.
Quarter 6	ENG 1340, Writing Workshop 1; one engineering science elective; two coordinated study electives; and one social science/humanities elective.
Quarter 7	Two engineering science electives, one coordinated study elective, and one social science/humanities elective.
Quarter 8	Two engineering science electives and two coordinated study electives.
Quarter 9	Two engineering science electives and two coordinated study electives.

Quarter 10	Two engineering science electives and two coordinated study electives.
Quarter 11	One engineering science elective and three coordinated study electives.

Specimen Program in Industrial Engineering

Quarters 1–3	See page 32.
Quarter 4	ECN 1115, Principles of Macroeconomics; IIS 1200, Work Design; MTH 1223, Calculus 4; and PHY 1224, Physics 4.
Quarter 5	ECN 1116, Principles of Macroeconomics; IIS 1330, Computation and Programming 1; ME 1201, Statics; and MTH 1225, Mathematical Analysis 1.
Quarter 6	ECE 1171, Electrical Engineering 1; IIS 1300, Probabilistic Analysis for Engineers; MTH 1230, Linear Algebra; and one engineering science elective.
Quarter 7	IIS 1310, Statistics 1; IIS 1340, Operations Research 1; one technical elective; and one behavioral science, social science, or humanities elective.
Quarter 8	ENG 1125, Technical Writing; IIS 1341, Operations Research; IIS 1436, Introduction to Quality Control; and IIS 1475, Human Factors.
Quarter 9	IIS 1350, Digital Simulation Techniques; IIS 1360, Engineering Economics and Statistical Decision Theory; IIS 1405, Production Inventory Control; one engineering science elective; and one behavioral science, social science, or humanities elective.
Quarter 10	HRM 1433, Organizational Behavior; two technical electives; and one behavioral science, social science, or humanities elective.
Quarter 11	IIS 1401, Design Project; one IIS technical elective; one behavioral science, social science, or humanities elective; and one open elective.

Specimen Program in Mechanical Engineering

Quarters 1–3	See page 32.
Quarter 4	ECN 1115, Principles of Macroeconomics <i>or</i> ME 1392 Measurement and Analysis; ME 1201, Statics; ME 1360, Thermodynamics 1; MTH 1223, Calculus 4.
Quarter 5	ECN 1116, Principles of Macroeconomics <i>or</i> ME 1392, Measurement and Analysis; ME 1202, Dynamics 1; ME 1361, Thermodynamics 3; and MTH 1225, Mathematical Analysis 1.
Quarter 6	ENG 1340, Writing Workshop; ME 1203, Strength of Materials 1; ME 1315, Dynamics 2; ME 1375, Fluid Mechanics 1; and MTH 1226, Mathematical Analysis 2.
Quarter 7	ECE 1171, Electrical Engineering; ME 1314, Strength of Materials 2; ME 1365, Heat Transfer; and MTH 1230, Linear Algebra.
Quarter 8	ME 1335, Mechanical Design <i>or</i> ME 1337 Thermal Design; ME 1362, Thermodynamics 3; ME 1380, Material Science; and one social science/humanities elective.
Quarter 9	ME 1335, Mechanical Design <i>or</i> ME 1337, Thermal Design; ME 1415, Mechanical Vibrations; one social science/humanities elective; and one physics/science elective.
Quarter 10	ME 1336, Design Project 1; two technical electives; and one social science/humanities elective.
Quarter 11	ME 1338, Design Project 2; two technical electives; and one social science/humanities elective.

Specimen Program for the Part-Time Evening BS Program in Mechanical Engineering

First Year	
Fall Quarter	GE 1100, Computer for Engineers and MTH 1123, Calculus 1.
Winter Quarter	CHM 1131, Chemistry 1; COM 1110, FORTRAN Lab; and MTH 1124, Calculus 2.
Spring Quarter	CHM 1132, Chemistry 2 and MTH 1125, Calculus 3.

Second Year

Fall Quarter	MTH 1223, Calculus 4; PHY 1221, Physics 1; and PHY 1521, Physics 1 Lab.
Winter Quarter	MTH 1225, Mathematical Analysis 1; PHY 1222, Physics 2; and PHY 1522, Physics 2 Lab.
Spring Quarter	MTH 1226, Mathematical Analysis 2 and PHY 1233, Physics 3.

Third Year

Fall Quarter	ME 1201, Statics and PHY 1224, Physics 4.
Winter Quarter	ME 1392, Measurements and Analysis and MTH 1230, Linear Algebra.
Spring Quarter	GE 1110, Engineering Graphics and Design and ME 1360, Thermodynamics 1.

Fourth Year

Fall Quarter	ME 1203, Strength of Materials 1 and ME 1361, Thermodynamics 2.
Winter Quarter	ME 1202, Dynamics 1 and ME 1375, Fluid Mechanics.
Spring Quarter	ME 1314, Strength of Materials 2 and ME 1365, Heat Transfer.

Fifth Year

Fall Quarter	ME 1335, Mechanical Design and ME 1337, Thermal Design.
Winter Quarter	ME 1336, Design Project 1 and ME 1380, Materials Science.
Spring Quarter	ME 1338, Design Project 3 and ME 1480, Mechanical Behavior of Materials.

Sixth Year

Fall Quarter	ME 1362, Thermodynamics 3 and ME ____, technical elective.
Winter Quarter	ECE 1171, Electrical Engineering 1; ENG 1340, Writing Workshop 1; and ME 1315, Dynamics 2.
Spring Quarter	ME 1415, Mechanical Vibrations; and ME ____, technical elective.

Specimen BS/MS Program in Mechanical Engineering

Freshmen admitted without advanced standing credit may take either the regular or the honors courses.

Quarters 1–3	See page 32.
Quarter 4	ECN 1115, Principles of Macroeconomics; ME 1201, Statics; ME 1360, Thermodynamics 1 <i>or</i> ME 1760, Thermodynamics 1 (Honors); ME 1392, Measurement and Analysis; and MTH 1223, Calculus 4.
Quarter 5	ECE 1171, Electrical Engineering 1; ME 1202, Dynamics 1 <i>or</i> ME 1702, Dynamics 1 (Honors); ME 1361, Thermodynamics 2; MTH 1225, Mathematical Analysis 1; and one social science/humanities elective.
Quarter 6	ENG 1340, Writing Workshop; ME 1203, Strength of Materials 1 <i>or</i> ME 1703, Strength of Materials 1 (Honors); ME 1315, Dynamics 2; ME 1375, Fluid Mechanics 1; ME 1380, Materials Science; and MTH 1230, Linear Algebra.
Quarter 7	ME 1314, Strength of Materials 2; ME 1365, Heat Transfer <i>or</i> ME 1765, Heat Transfer (Honors); ME 1415, Mechanical Vibrations; MTH 1226, Mathematical Analysis 2; and one physics/science elective.
Quarter 8	ME 1335, Mechanical Design <i>or</i> ME 1337, Thermal Design; ME 1336, Design Project 1; ME 1362, Thermodynamics 3; ME 3100, Mathematical Methods; and one technical elective.

Quarter 9	ME 1335, Mechanical Design <i>or</i> ME 1337, Thermal Design; ME 1338, Design Project 2; two technical electives <i>or</i> one technical elective and ME 1796, Independent Study 1 (Honors); and one social science/humanities elective.
Quarter 10	Three graduate courses; one seminar (thesis) course; and one technical elective.
Quarter 11	Two graduate courses and one thesis course.
Quarter 12	Two graduate courses and one thesis course.

School of Engineering Technology

Specimen Program in Aerospace Maintenance

Quarter 1	ENG 1110, Freshman English 1; GET 1170, Engineering Graphics 1; MTH 1194, Calculus 2; PHY 1191, Physics 1; and PHY 1196, Physics Lab 1.
Quarter 2	ENG 1111, Freshman English 2; GET 1100, Computer Programming for Engineering Technology; PHY 1192, Physics 2; PHY 1197, Physics Lab 2; and one social science/humanities elective.
Quarter 3	GET 1171, Engineering Graphics 2; MTH 1195, Calculus 3; PHY 1193, Physics 3; PHY 1198, Physics Lab 3; and SPC 1115, Introduction to Communications Skills.
Quarter 4	ECN 1115, Principles of Macroeconomics; EET 1320, Electricity and Electronics 1; ENG 1125, Technical Writing; MET 1301, Mechanics A; and MET 1340, Thermodynamics A.
Quarter 5	MET 1302, Mechanics B; MET 1314, Stress Analysis A; MET 1380, Materials A; and one social science/humanities elective.
Quarter 6	MET 1315, Stress Analysis B <i>or</i> MET 1341, Thermodynamics B; MET 1390, Measurement and Analysis Lab; MET 1481, Materials B; one technical elective; and one social science/humanities elective.
Quarter 7	MET 1370, Fluid Mechanics A; MET 1391, Technology Lab A <i>or</i> MET 1393, Technology Lab C; one technical elective; and two social science/humanities electives.

Specimen Program in Electrical Engineering Technology

Quarter 1	ENG 1110, Freshman English 1; GET 1170, Engineering Graphics 1; MTH 1191, College Algebra; PHY 1191, Physics 1; and PHY 1196, Physics Lab 1.
Quarter 2	ENG 1111, Freshman English 2; GET 1100, Computer Programming for Engineering Technology; MTH 1192, Pre-Calculus; PHY 1192, Physics 2; and PHY 1197, Physics Lab 2.
Quarter 3	GET 1171, Engineering Graphics 2; MTH 1193, Calculus 1; PHY 1193, Physics 3; PHY 1198, Physics Lab 3; and SPC 1115, Speech Communications.
Quarter 4	ECN 1115, Principles of Macroeconomics; EET 1151, Circuit Analysis 1; MTH 1194, Calculus 2; and one social science/humanities elective.
Quarter 5	EET 1123, Circuits Lab 1; EET 1152, Circuit Analysis 2; MET 1319, Mechanics; MTH 1195, Calculus 3; and one social science/humanities elective.
Quarter 6	EET 1125, Circuits Lab 2; EET 1311, Electronics 1; EET 1353, Circuit Analysis 3; EET 1360, Engineering Analysis 1; and ENG 1125, Technical Writing.
Quarter 7	EET 1310, Electrical Measurement; EET 1312, Electronics 2; EET 1323, Electronics Lab; and EET 1354, Circuit Analysis 4.
Quarter 8	EET 1313, Electronics 3, EET 1327, Advanced Electronics Lab 1; EET 1330, Energy Conversion; one technical elective; and one social science/humanities elective.

Quarter 9	EET 1314, Pulse and Digital 1; EET 1328, Advanced Electronics Lab 2; EET 1337, Distributed Systems; one technical elective; and one social science/humanities elective.
Quarter 10	EET 1329, Advanced Electronics Lab 3; EET 1370, Digital Computers 1; EET 1377, Control Engineering 1; one technical elective; and one open elective.
Quarter 11	EET 1371, Digital Computers 2; EET 1378, Control Engineering 2; one technical elective; and one social science/humanities elective.

Specimen Program in Mechanical Engineering Technology

Quarter 1	ENG 1110, Freshman English 1; GET 1170, Engineering Graphics 1 or GE 1100, Computer for Engineers; MTH 1191, College Algebra; PHY 1191, Physics 1; and PHY 1196, Physics 1 Lab.
Quarter 2	ENG 1111, Freshman English 2; GET 1100, Computer Programming for Engineering Technology or GET 1170, Engineering Graphics 1; MTH 1192, Pre-Calculus; PHY 1192, Physics 2; and PHY 1197, Physics 2 Lab.
Quarter 3	GET 1171, Engineering Graphics 2; MTH 1193, Calculus 1; PHY 1193, Physics 3; PHY 1198, Physics Lab 3; and SPC 1115, Introduction to Communication Skills.
Quarter 4	EET 1320, Electricity and Electronics; GET 1364, Kinematics; MET 1301, Mechanics A; and MTH 1194, Calculus 2.
Quarter 5	CHM 1130, Fundamentals of Chemistry; CHM 1138, General Chemistry Lab; MET 1302, Mechanics B; MET 1314, Stress Analysis A; and MTH 1195, Calculus 3.
Quarter 6	ENG 1125, Technical Writing 1; MET 1303, Mechanics C; MET 1315, Stress Analysis B; MET 1340, Thermodynamics A; and MET 1390, Measurement and Analysis Lab.
Quarter 7	ECN 1115, Principles of Macroeconomics; MET 1341, Thermodynamics B; MET 1370, Fluid Mechanics A; MET 1380, Materials A; and MET 1391, Technology Lab A.
Quarter 8	MET 1330, Mechanical Design A; MET 1371, Fluid Mechanics B; MET 1392, Technology Lab B; MET 1396, Machine Shop or IIS ____ elective; and one social science/humanities elective.
Quarter 9	MET 1331, Mechanical Design B; MET 1343, Heat Transfer; MET 1393, Technology Lab C; one technical elective; and one social science/humanities elective.
Quarter 10	MET 1366, Engineering Economy; MET 1394, Technology Lab D; MET 1481, Materials B or MET 1416, Stress Analysis C; one technical elective; and one social science/humanities elective.
Quarter 11	MET 1343, Heat Transfer; MET 1395, Technology Lab E; one open elective; and one social science/humanities elective.

Specimen Program in Computer Technology

Quarter 1	ENG 1110, Freshman English 1; GET 1170, Engineering Graphics 1; MTH 1191, College Algebra; PHY 1191, Physics 1; and PHY 1196, Physics 1 Lab.
Quarter 2	CT 1105, Introduction to Programming; ENG 1111, Freshman English 2; MTH 1192, Pre-Calculus; PHY 1192, Physics 2; and PHY 1197, Physics 2 Lab.
Quarter 3	CT 1150, Computer Organization; MTH 1193, Calculus 1; PHY 1193, Physics 3; PHY 1198, Physics Lab 3; and SPC 1115, Introduction to Communication Skills.
Quarter 4	CT 1310, FORTRAN/File Processing; ECN 1115, Principles of Macroeconomics; EET 1151, Circuit Analysis 1; and MTH 1194, Calculus 2.
Quarter 5	CT 1311, Programming with C Language; EET 1152, Circuit Analysis 2; MTH 1195, Calculus 3; and one social science/humanities elective.
Quarter 6	CT 1340, Modern Programming Techniques; CT 1345, Assembly Language; EET 1311, Electronics 1; and ENG 1125, Technical Writing 1.

Quarter 7	CT 1330, Data Structures; CT 1368, Semiconductor Logic; CT 1374, Introduction to CPU Hardware; and one social science/humanities elective.
Quarter 8	CT 1335, Numerical Methods; CT 1369, Computer Logic; CT 1375, CPU Hardware Architecture; one computer technology elective; and one social science/humanities elective.
Quarter 9	CT 1355, Microprocessor Peripheral Hardware; CT 1380, Data Communication Methods; one computer technology elective; and one social science/humanities elective.
Quarter 10	CT 1356, Complex Peripheral Hardware; CT 1360, Industry Software; one computer technology elective; and one social science/humanities elective.
Quarter 11	CT 1351, Advanced Computer Organization; CT 1365, Industry Hardware; one technical elective; and one social science/humanities elective.

College of Nursing

Specimen Program for BS in Nursing

Quarter 1	BIO 1115, Introduction to Human Biology; ENG 1110, Freshman English 1; MTH 1106, Fundamentals of Mathematics; and NUR 1100, Introduction to Professional Nursing and the Health System.
Quarter 2	BIO 1152, Integrated Anatomy and Physiology 1; CHM 1111, General Chemistry; ENG 1111, Freshman English 2; and NUR 1101, Introduction to the Theoretical Basis for Nursing Practice.
Quarter 3	BIO 1153, Integrated Anatomy and Physiology 2; CHM 1112, General Chemistry; NUR 1102, Introduction to Human Nutrition; and SOC 1100, Introduction to Sociology.
Quarter 4	BIO 1120, Basic Microbiology; BIO 1154, Integrated Anatomy and Physiology 3; NUR 1200, Nursing Basic Human Needs 1; and PSY 1111, Foundations of Psychology 1.
Quarter 5	NUR 1201, Nursing Basic Human Needs 2; NUR 1202, Introduction to Pathophysiological Concepts for Clinical Nursing; PSY 1112, Foundations of Psychology 2; and one computer elective.
Quarter 6	NUR 1300, Nursing Common Problems; NUR 1302, Transition (RN only); PCL 1305, Pharmacodynamics; PSY 1241, Human Behavioral Development 1; and SOA 1100, Peoples and Cultures.
Quarter 7	ENG 1350, Intermediate Writing; NUR 1301, Psychiatric/Mental Health Nursing; and PSY 1242, Human Behavioral Development 2.
Quarter 8	NUR 1401, Medical-Surgical Nursing; one humanities elective; and one open elective.
Quarter 9	NUR 1400, Maternal and Child Nursing; one humanities elective; and one history elective.
Quarter 10	NUR 1500, Community Health Nursing; and two open electives.
Quarter 11	NUR 1501, Contemporary Issues in Nursing; NUR 1502, Introduction to Research in Nursing; and one open elective (optional).

College of Pharmacy and Allied Health Professions

Specimen Program in Pharmacy

Quarter 1	BIO 1106, General Biology; CHM 1111, General Chemistry 1; MTH 1106, Fundamentals of Mathematics or MTH 1107, Functions and Basic Calculus; PHP 1100, The Profession of Pharmacy; and one arts and sciences elective.
Quarter 2	BIO 1107, Animal Biology; ENG 1110, Freshman English 1; MTH 1107, Functions and Basic Calculus or MTH 1108, Calculus; and PAH 1135, Professional Dynamics in Health Care Delivery.
Quarter 3	CHM 1122, General Chemistry 2B; ENG 1111, Freshman English 2; MTH 1108, Calculus or an open elective; and one arts and sciences elective.
Quarter 4 (Entire class) (Sept.–Dec.)	CHM 1268, Organic Chemistry 1; PCT 1240, Pharmaceutical Calculations; PHY 1201, Physics 1; and one arts and sciences elective.
Quarter 4A (Entire class) (Jan.–March)	CHM 1269, Organic Chemistry 2; PAH 1202, Anatomy and Physiology 1; PHY 1203, Physics 3; and one arts and sciences elective.
Quarter 5 (April–June and June–Sept.)	ENG 1340, Writing Workshop; INT 1100, Beginning Computer Use; PAH 1204, Anatomy and Physiology 2; PAH 1280, Biochemistry; and PHP 1303, Interpersonal Skills for Health Professionals.
Quarter 6	PCT 1310, Pharmaceutics Lab 1; PCT 1340, Pharmaceutics 1; PHP 1411, Pathophysiology; PMC 1321, Pharmaceutical Analysis and Quality Control; and PMC 1419, Pharmacology/Medicinal Chemistry 1.
Quarter 7	BIO 1121, Microbiology; PCL 1420, Pharmacology/Medicinal Chemistry 2; PCL 1451, Pharmacology Lab; PCT 1320, Pharmaceutics Lab 2; and PCT 1350, Pharmaceutics 2.
Quarter 8	PCL 1422, Pharmacology/Medicinal Chemistry 3; PCT 1440, Biopharmaceutics/Pharmacokinetics; PHP 1301, Pharmaceutical Jurisprudence; and PMC 1421, Antiinfectives.
Quarter 9 (Entire class) (April through June)	PHP 1401, Drug Information and Evaluation; PHP 1402, Parapharmaceuticals; PHP 1441, Therapeutic Drug Monitoring; PHP 1601, Nonprescription Medication; and PHP 1602, Pharmacotherapeutics.
Quarter 10 (Summer/Winter)	PHP 1302, Pharmacy Administration 1; PHP 1304, Social Pharmacology; PHP 1504, Professional Practice Lab 1; one professional elective; and one arts and sciences elective.
Quarter 10A (Fall/Spring)	PHP 1305, Hospital Pharmacy Management or PHP 1306, Community Pharmacy Management; TOX 1300, Clinical Toxicology; one professional elective; and one arts and sciences elective.
Quarter 11	PHP 1501, Pharmacy Externship.
Quarter 12	PHP 1502, Clinical Pharmacy Clerkship.

Specimen BS Program in Dental Hygiene

Quarter 1	BIO 1106, General Biology; ENG 1110, Freshman English 1; MTH 1106, Fundamentals of Mathematics; PSY 1111, Foundations of Psychology 1; and one professional course.
Quarter 2	BIO 1107, Animal Biology; CHM 1111, General Chemistry; MTH 1107, Functions and Basic Calculus; PAH 1135, Professional Dynamics in Health Care Delivery; and one professional course.
Quarter 3	BIO 1120, Basic Microbiology; CHM 1112, General Chemistry 2A; ENG 1111, Freshman English 2; SOC 1100, Introduction to Sociology; and one professional course.

Quarter 4	PAH 1202, Anatomy and Physiology 1; professional courses; and one elective.
Quarter 5	PAH 1204, Anatomy and Physiology 2; professional courses; and one elective.
Quarter 6	PHP 1303, Interpersonal Skills for Health Professionals; and professional courses.
Quarter 7	MTH 1152, Statistical Thinking; and professional courses.
Quarter 8	Professional courses and one elective.
Quarter 9	Professional courses and one elective.
Quarter 10	ENG 1125, Technical Writing 1; professional courses; and one professional elective.
Quarter 11	Professional courses, one professional elective, and one elective.
Quarter 12	Professional courses, one professional elective, and one elective.

Specimen AS Program in Dental Hygiene

Quarter 1	BIO 1150, Human Anatomy and Physiology 1; CHM 1101, General Chemistry 1; and professional courses.
Quarter 2	BIO 1151, Human Anatomy and Physiology 2; CHM 1102, General Chemistry 2; and professional courses.
Quarter 3	BIO 1120, Basic Microbiology; and professional courses.
Quarter 4	ENG 1110, Freshman English 1; and professional courses.
Quarter 5	PSY 1111, Foundations of Psychology 1; and professional courses.
Quarter 6	ENG 1111, Freshman English 2; SOC 1110, Introduction to Sociology; and professional courses.

Specimen Program in Medical Laboratory Science

Quarter 1	BIO 1106, General Biology; ENG 1110, Freshman English 1; MLS 1101, MLS Orientation 1; MTH 1106, Fundamentals of Mathematics or MTH 1107, Functions and Basic Calculus; and one elective.
Quarter 2	BIO 1107, Animal Biology; CHM 1111, General Chemistry 1; MLS 1102, MLS Orientation 2; PAH 1135, Professional Dynamics in Health Care Delivery; and one elective.
Quarter 3	CHM 1112, General Chemistry 2; ENG 1111, Freshman English 2; MLS 1112, Renal Physiology and Urinalysis; MLS 1212, Urinalysis Lab; and one computer elective.
Quarter 4	BIO 1253, Human Physiology 1; CHM 1264, Organic Chemistry 1; MLS 1123, Basic Hematology 1; MLS 1124, Basic Hematology 2; MLS 1171, Basic Immunology; MLS 1223, Basic Hematology Lab; and MLS 1271, Basic Immunology Lab.
Quarter 4A	MLS 1132, Immunohematology; MLS 1142, Basic Clinical Microbiology 1; MLS 1152, Basic Clinical Chemistry and Instrumentation; MLS 1232, Basic Immunohematology Lab; MLS 1242, Basic Clinical Microbiology 1 Lab; MLS 1252, Basic Clinical Chemistry and Instrumentation Lab; and one elective.
Quarter 5	BIO 1254, Human Physiology 2; CHM 1265, Organic Chemistry 2; MLS 1143, Basic Clinical Microbiology 2; MLS 1243, Basic Clinical Microbiology 2 Lab; MLS 1641, Medical Parasitology; MLS 1644, Medical Parasitology Lab; and one elective.
Quarter 6	BIO 1260, Genetics and Developmental Biology; MLS 1672, Immunopathology; PHY 1201, Physics 1; PHY 1501, Physics 1 Lab; and a statistics course.
Quarter 7	BIO 1261, Cell Physiology and Biochemistry; ENG 1340, Writing Workshop; MLS 1654, Advanced Clinical Chemistry 1; PHY 1202, Physics 2; PHY 1502, Physics 2 Lab; and one elective.

Quarter 8	MLS 1621, Advanced Hematology 1; MLS 1631, Advanced Immunohematology; MLS 1648, Advanced Clinical Microbiology; MLS 1655, Advanced Clinical Chemistry 2; and MLS 1892, Current Concepts.
Quarter 9	MLS 1532, Immunohematology MT Applied Study; MLS 1552, Clinical Chemistry MT Applied Study; and MLS 1573, Clinical Immunology MT Applied Study 1.
Quarter 10	MLS 1523, Hematology MT Applied Study; MLS 1544, Clinical Microbiology MT Applied Study; MLS 1574, Clinical Immunology MT Applied Study 2; and MLS 1890, Undergraduate Research (optional).
Quarter 11	MLS 1661, MLS Education; MLS 1662, Clinimetrics; MLS 1665, Medical Laboratory Management; MLS 1681, Senior Seminar; and two electives.

Specimen Program in Health Information Administration

Quarter 1	BIO 1106, General Biology; ENG 1110, Freshman English 1; HRA 1100, Orientation to Medical Records 1; MTH 1101, Basic Math; and PSY 1111, Fundamentals of Psychology 1.
Quarter 2	BIO 1107, Animal Biology; MTH 1103, Basic Math; PAH 1135, Dynamics of Health Care; and one arts and sciences elective.
Quarter 3	BIO 1121, Introduction to Microbiology; ENG 1111, Freshman English 2; PSY 1112, Fundamentals of Psychology 2; and one arts and sciences elective.
Quarter 4	BIO 1150, Human Anatomy and Physiology 1; HRA 1321, Language of Health Professions; SOA 1100, Anthropology or SOC 1100, Introduction to Sociology; one arts and sciences elective; and one open elective.
Quarter 5	BIO 1151, Human Anatomy and Physiology 2; MTH 1150, Probability, Statistics, and the Computer; SPC 1115, Introduction to Communication Skills; and one arts and sciences elective.
Quarter 6	HRA 1310, Hospital Law; HRA 1320, Language of Medicine; HRA 1330, Foundations of Medical Science 1; HRA 1410, Health Records Science 1; and one open elective.
Quarter 7	ENG 1340, Writing Workshop; HRA 1340, Foundations of Medical Science 2; HRA 1420, Health Records Science 2; HRM 1432, Organizational Behavior; and INT 1100, Beginning Computer Use.
Quarter 8	HRA 1430, Health Records Science 3; HRA 1450, Application Health Records Directed Practice 1; HRA 1510, Management of Health Records Services 1; HRA 1580, Training and Developing Health Care Professionals; and HRA 1610, Introduction to Data Processing for Health Sciences.
Quarter 9	HRA 1440, Health Records Science 4; HRA 1460, Application Health Records Directed Practice 2; HRA 1520, Management of Health Records Services 2; HRA 1540, Quality Assurance; and HRA 1640, Medical Computer Applications.
Quarter 10	HRA 1530, Management of Health Records Services 3; HRA 1620, Systems Analysis; HRA 1630, Introduction to Health Data Research; and one open elective.
Quarter 11	HRA 1471, Application of Health Records Services 3; HRA 1560, Seminar in Health Records; HRA 1570, The Health Record Professional: Issues and Problems; HRA 1800, Independent Study; and HRA 1820, Special Topics 2.

Specimen Program in Respiratory Therapy

Quarter 1	BIO 1140, Basic Animal Biology 1; CHM 1111, General Chemistry 1; ENG 1110, Freshman English 1; PSY 1111, Foundations of Psychology; and RTH 1111, Respiratory Therapy Seminar 1.
Quarter 2	BIO 1141, Basic Animal Biology 2; MTH 1106, Fundamentals of Mathematics; PAH 1135, Professional Dynamics in the Health Care Delivery System; RTH 1112, Respiratory Therapy Seminar 2; and one arts and sciences elective.

Quarter 3	BIO 1120, Basic Microbiology; CHM 1122, General Chemistry 2B; ENG 1111, Freshman English 2; MTH 1107, Functions and Basic Calculus; and RTH 1113, Respiratory Therapy Seminar 3.
Quarter 4	PAH 1202, Anatomy and Physiology 1; PHY 1209, Basic Physics 1; RTH 1301, Professional Practice Lab 1; RTH 1331, Introduction to Patient Care; and one arts and sciences elective.
Quarter 5	PCL 1409, Pharmacology; PHY 1204, Anatomy and Physiology; RTH 1211, Practicum in Respiratory Care 1; RTH 1302, Professional Practice Lab 2; and RTH 1332, Introduction to Respiratory Care.
Quarter 6	RTH 1312, Practicum in Respiratory Care 2; RTH 1320, Cardiopulmonary Physiology; RTH 1403, Professional Practice Lab 3; RTH 1414, Clinical Seminar 1; RTH 1433, Respiratory Care for Medical-Surgical Patients; and RTH 1435, Introduction to Pediatric Respiratory Care.
Quarter 7	ENG 1340, Writing Workshop; RTH 1313, Practicum in Respiratory Care 3; RTH 1321, Cardiopulmonary Disease; RTH 1404, Professional Practice Lab 4; RTH 1415, Clinical Seminar 2; and RTH 1434, Respiratory Care for Critical Patients.
Quarter 8	PHL 1165, Moral Problems in Medicine; PHP 1411, Pathophysiology; RTH 1505, Cardiopulmonary Lab Practice; RTH 1573, Cardiopulmonary Lab Technology; and one computer elective.
Quarter 9	RTH 1576, Neonatal Respiratory Care; two arts and sciences electives; and one computer elective.
Quarter 10	RTH 1578, Advanced Medical Monitoring; one arts and sciences elective; and two professional electives.
Quarter 11	RTH 1574, Advanced Clinical Physiology; one arts and sciences elective; and two professional electives.

Specimen Program in Toxicology

Quarter 1	BIO 1106, General Biology 1; ENG 1110, English 1; MTH 1107, Functions and Basic Calculus; TOX 1100, Toxicology Orientation; and one arts and sciences elective.
Quarter 2	CHM 1111, General Chemistry 1; ENG 1111, Freshman English 2; PAH 1135, Professional Dynamics in Health Care Delivery; and PHY 1201, Physics 1.
Quarter 3	BIO 1107, Animal Biology 2; CHM 1122, Chemistry 2B; MTH 1108, Calculus; and one arts and sciences elective.
Quarter 4	CHM 1264, Organic Chemistry 1; MTH 1150, Math Problems and Statistics or PSY 1211, Statistics in Behavioral Science 1; PAH 1202, Anatomy and Physiology 1; and PHY 1203, Physics 3.
Quarter 5	CHM 1265, Organic Chemistry 2; PAH 1204, Anatomy and Physiology 2; and one arts and sciences elective.
Quarter 6	PAH 1280, Biochemistry; PCL 1411, Pathophysiology; PMC 1419, Medicinal Chemistry Pharmacology 1; and one arts and sciences elective.
Quarter 7	ENG 1340, Writing Workshop; MLS 1151, Clinical Chemistry; PCL 1420, Pharmacology/Medicinal Chemistry 2; PCL 1451, Pharmacology Lab; and TOX 1300, Clinical Toxicology 1.
Quarter 8	CHM 1221, Analytical Chemistry or PMC 1321, Pharmaceutical Analysis and Quality Control; PCL 1422, Pharmacology/Medicinal Chemistry 3; TOX 1322, Biochemical Toxicology Lab; and one arts and sciences elective.
Quarter 9	BIO 1120, Basic Microbiology; BIO 1261, Cell Physiology and Biochemistry; TOX 1301, Principles of Systemic Toxicology; and one or two arts and sciences electives.
Quarter 10	CHM 1431, Instrumental Analysis; CHM 1461, Identification of Organic Compounds; PCT 1440, Biopharmaceutics/Pharmacokinetics; and one open elective.
Quarter 11	HSL 1506, Community Health; MLS 1341, Epidemiology; TOX 1302, Chemical and Analytical Toxicology; and one or two arts and sciences electives.

University College Alternative Freshman-Year Program

Business Track: One-Year Program

Quarter 1	ED 4003, Integrated Language Skills Development A; ENG 4013, Fundamentals of English 1; HST 4110, History of Civilization A <i>or</i> a required business course; and MTH 1000, Math Preliminaries 1.
Quarter 2	ED 4004, Integrated Language Skills Development B; ENG 4014, Fundamentals of English 2; HST 4110, History of Civilization A <i>or</i> a required business course; and MTH 1010, Math Preliminaries 2.
Quarter 3	ECN 4601, Economics 1 <i>or</i> a directed elective; HST 4111, History of Civilization B; MGT 4110, Survey of Business and Management <i>or</i> a directed elective; and MTH 1113, Math for Business.

Criminal Justice, Education, or Arts and Sciences Track: One-Year Program

Quarter 1	ED 4003, Integrated Language Skills Development A; ENG 4013, Fundamentals of English 1; MTH 1000, Math Preliminaries 1; and SOC 4010, Principles of Sociology 1 <i>or</i> a directed elective.
Quarter 2	ED 4004, Integrated Language Skills Development B; ENG 4014, Fundamentals of English 2; HST 4110, History of Civilization A <i>or</i> a directed elective; and MTH 1010, Math Preliminaries 2 <i>or</i> SOC 4011, Principles of Sociology 2.
Quarter 3	ENG 1111, Freshman English 2 <i>or</i> a directed elective; HST 4111, History of Civilization B; POL 4106, Introduction to Politics; and SOC 4011, Principles of Sociology 2 <i>or</i> an elective.

Health Science Track

Quarter 1	CHM 1110, General Chemistry Preliminaries; ED 4001, Integrated Language Skills Development 1; ENG 4013, Fundamentals of English 1; and MTH 1010, Math Preliminaries 2.
Quarter 2	CHM 1111, General Chemistry 1; ED 4002, Integrated Language Skills Development 2; ENG 4014, Fundamentals of English 2; and MTH 1106, Fundamentals of Mathematics.
Quarter 3	BIO 1140, Basic Animal Biology 1; CHM 1112, General Chemistry 2A; ENG 1111, Freshman English 2 <i>or</i> a directed elective; and a directed elective.
Quarter 4	BIO 1141, Basic Animal Biology 2; MTH 1107, Functions and Basic Calculus; and a directed elective.

The Writing Center

The Writing Center offers free assistance to all students on any writing projects. Our trained tutors work one-on-one with writers on class assignments or other writing tasks. The Writing Center staff includes specialists in academic essay writing, technical writing, business writing, research and documentation, editing, grammar, English as a second language, and literary analysis. Students may either drop in at 102 Cahners Hall, 110 The Fenway, or phone ahead for an appointment, 617-437-3086. Most tutoring sessions last half an hour. Regular Writing Center hours are Monday through Thursday, 10 AM to 4 PM. Some evening hours are available.

Middler Year Writing Requirement

The middler year writing requirement (MYWR) is effective for freshmen who entered the University as of fall 1984 and after and for transfer students who entered as of fall 1985 and after. All middlers (that is, students who have earned 80+ quarter hours including nonco-op students) must complete this graduation requirement at Northeastern. Successful completion of Freshman English is a prerequisite to the MYWR. To complete the middler year writing requirement, students must earn a grade of C (2.0) or better in a four-credit writing course or a pass in a one-credit, pass/fail Writing Workshop.

This University requirement is designed to help students improve their writing for major courses and in their workplaces. The four primary courses are therefore interdisciplinary so that students may write in subjects related to their major.

Students should review the information below. For additional information, students may contact the MYWR Office at 433 Holmes Hall, 617-437-3964.

Middler Year Writing Requirement Courses

Primary MYWR courses.

ENG 1350	Intermediate Writing
ENG 1381	Writing for the Professions: Business Administration
ENG 1382	Writing for the Professions: Criminal Justice
ENG 1125	Technical Writing
ENG 1340	Writing Workshop

Primary MYWR courses recommended by the following colleges.

College of Arts and Sciences

ENG 1350

Boston-Bouv  College of Human Development Professions

ENG 1350 or ENG 1340

College of Business Administration

ENG 1381

College of Computer Science

ENG 1125

College of Criminal Justice

ENG 1350

College of Engineering

ENG 1125 or ENG 1340

School of Engineering Technology

ENG 1340

College of Nursing

ENG 1350

College of Pharmacy and Allied Health Professions

ENG 1340

Important: Colleges have specific guidelines and schedules for options that apply to majors. Students should consult their dean's office or adviser for guidelines.

Basic College Compensatory Courses

Basic College Compensatory Courses in English and mathematics are for freshman native speakers of English whose reading, writing, or mathematical skills need to be strengthened.

The University uses one or more of three criteria to determine which freshmen participate in the compensatory programs: pre-college academic credentials, tests administered during orientation week, or performance in ENG 1110, Freshman English 1.

In general, the program consists of six courses, each offering four hours of credit. The courses must fit into the following sequences.

Fall*

MTH 1000	Mathematical Preliminaries 1
ENG 1110	Freshman English 1†
or	
ENG 1013	Fundamentals of English 1
ED 1003	Reading/Study Skills

Winter*

MTH 1010	Mathematical Preliminaries 2
ENG 1014	Intensive Writing

Special Notes

Successful completion of Mathematical Preliminaries 1 and 2 is a prerequisite for

MTH 1101, MTH 1106, MTH 1107, and MTH 1108	Nonbusiness mathematics sequence
MTH 1113 and MTH 1114	Business mathematics sequences

A passing letter grade in Freshman English 1 or Intensive Writing is a prerequisite for

ENG 1111	Standard Freshman English 2
ENG 1111–ENG 1113	Engineering sequence
ENG 1111	Engineering technology sequence

*The same sequence is offered winter/spring for students who enter in January.
†Students whose work in this course is unacceptable for success in ENG 1111, Freshman English 2, will receive a grade of S and must complete ENG 1014, Intensive Writing.

Schedule for Continuation of Compensatory Programming in the Basic Colleges

Acceptance for credit is determined by the faculties of the individual colleges and is therefore subject to change. The chart below outlines the Basic Colleges' policies on compensatory courses. Asterisked (*) courses are graded pass/fail and therefore are not included in the student's quality/point average. A *yes* designates acceptance for credit, a *no* nonacceptance, and an *n/a* not applicable.

	English 1 (ENG 1110/ 1013)	English 2 (ENG 1014)	Mathematical Preliminaries* (MTH 1000)	Mathematical Preliminaries 2* (MTH 1010)	Reading Study Skills (ED 1003)
Arts and Sciences	yes	yes	yes	yes	yes
Bouvé: Physical Therapy	yes	yes	no	no	no
Bouvé: Physical Education	yes	yes	yes	yes	yes
Bouvé: Recreation and Leisure Studies	yes	yes	no	no	no
Bouvé: Teacher Preparations	yes	yes	yes	yes	yes
Business Administration	yes	yes	yes	yes	no

Computer Science[†]	yes	yes	n/a	n/a	n/a
Criminal Justice	yes	yes	yes ^{††}	yes ^{††}	yes
Engineering[†]	n/a	n/a	n/a	n/a	n/a
Engineering Technology	yes	yes	n/a	n/a	n/a
Nursing	yes	yes	no	no	no
Pharmacy and Allied Health Professions	yes, but w/o credit [§]	yes	no	no	no

[†]This college offers MTH 1120 and MTH 1121, a course sequence in college calculus with algebra and trigonometry, to students who test deficient in mathematics. The sequence involves extra work in algebra and trigonometry and covers the same material as the regular freshman calculus sequences.

^{††}Students whose diagnostic examinations suggest a need for basic mathematics may elect MTH 1000 or MTH 1010 to prepare for MTH 1106, Fundamentals of Mathematics.

[§]This college will accept ENG 1110 or ENG 1014 for credit only (with a letter grade). Students who complete English courses must still take a four-credit English elective.



Course Descriptions

Chemical Engineering

The course descriptions listed under chemical engineering are intended to show the general scope of the subject that will be covered. Since courses are continually updated, specific topics or methods of approach may vary from term to term. In addition to meeting course prerequisites, students are expected to take each chemical engineering course in the sequence shown on the specimen program sheet.

CHE 1201 Chemical Engineering Calculations 1 4 QH

Examines the application of fundamental laws of mass and energy conservation to chemical and physical processes. Emphasizes material balances. A corequisite computational lab aids students in improving facility in handling problems typical of the course. Lab fee. *Prereq.* CHM 1132 and CHM 1138. Take concurrently with CHE 1205.

CHE 1202 Chemical Engineering Calculations 2 4 QH

Continues CHE 1201, emphasizing energy balances and the simultaneous application of mass and energy conservation laws. Considers typical chemical processing industry problems. *Prereq.* CHE 1201.

CHE 1205 Computation Laboratory 2 QH

Offers lab sessions to aid students in problem formulation and solution. The assignments are based on material presented in CHE 1201. Emphasis is placed on computer software applications. Lab fee. *Prereq.* Taken with CHE 1201.

CHE 1211 Chemical Engineering Thermodynamics 1 4 QH

Topics include the first law and its application to batch and flow systems, heat effects in chemicals, and physical properties of real fluids. Applies basic principles and mathematical relations to the analysis and solution of engineering problems. *Prereq.* CHE 1201 and CHE 1205.

CHE 1300 Chemical Engineering Calculations 2 4 QH

Emphasizes energy balances and the simultaneous application of mass and energy conservation laws in steady and unsteady state processes. Problems are selected from chemical processing industry applications. *Prereq.* CHE 1201 and CHE 1211.

CHE 1310 Chemical Engineering Thermodynamics 2 4 QH

Covers thermodynamic properties of mixtures; fugacity and the fugacity coefficients from equations of state for gaseous mixtures; liquid phase fugacities and activity coefficients for liquid mixtures; phase equilibria; the equilibrium constant for homogeneous gas-phase reactions; and extension of theory to handle simultaneous, heterogeneous, and solution reactions. *Prereq.* CHE 1300.

CHE 1320 Momentum Transport 4 QH

Topics include physical properties of fluids, pipe flow for process application, macroscopic balances and their application, and microscopic balances. *Prereq.* CHE 1211 and CHE 1300.

CHE 1410 Experimental Methods 1 4 QH

Explores an experimental approach to solving chemical engineering problems and preparing reports to detail the results and their interpretations. Presents experiments that illustrate the fundamental unit operations. Lab fee. *Prereq.* CHE 1320.

CHE 1411 Experimental Methods 2 4 QH

Continues CHE 1410, requiring more advanced experimentation and more sophisticated reports. Lab fee. *Prereq.* CHE 1410.

CHE 1421 Chemical Engineering Kinetics 4 QH

Topics include fundamental theories of the rate of chemical change in homogeneous reacting systems; integral and differential analysis of kinetic data; design of batch and continuous-flow chemical reactors; and an introduction to heterogeneous reactions and reactor design. *Prereq.* CHE 1310.

CHE 1430 Heat Transport 4 QH

Examines analytical and numerical integration of heat conduction equations; theoretical and empirical determination of film coefficients of heat transfer; natural convection; heat transfer with phase change; overall coefficient of heat transfer; design of shell-and-tube heat exchangers; and single and multiple effect evaporation. *Prereq.* CHE 1320.

CHE 1440 Separation Processes 4 QH

Covers binary flash distillation; analysis of column distillation through internal stage-by-stage balances; McCabe-Thiele graphical method; Analytical Lewis method; staged column design; packed column design; absorption and stripping; and mass transfer analysis. *Prereq.* CHE 1310.

CHE 1450 Chemical Engineering Economics 4 QH

Introduces financial decision-making techniques as applied to problems of production, storage, transportation, and utilization of chemical resources to meet societal needs. *Prereq.* ECN 1115.

CHE 1501 Chemical Process Design 1 6 QH

Focuses on the design of a chemical process. Topics include computer simulation of steady-state processing conditions, selecting process operations, preparing flowsheets and stream tables, and evaluating the economics of a chemical process design. Explores a comprehensive chemical process design problem with a team approach. *Prereq.* CHE 1421 and CHE 1441.

CHE 1502 Chemical Process Design 2 6 QH

Continues CHE 1501. Topics include heat and power integration in chemical processing, design and scheduling of batch processes, sequencing separation operations, and safety considerations in process design. Requires the student to solve individually a comprehensive chemical process design problem. *Prereq.* CHE 1501.

CHE 1503 Projects 1 6 QH

Offers individual research related to some phase of chemical engineering. Open only to students selected by the department head on the basis of scholarship and proven ability. Lab fee. *Prereq.* Senior standing and consent of department.

CHE 1504 Projects 2 6 QH

Continues the research work begun in CHE 1503. Lab fee. *Prereq.* CHE 1503.

CHE 1511 Mathematical Methods in Chemical Engineering 4 QH

Examines the formulation and solution of problems taken from chemical and engineering studies that require advanced mathematical methods. Emphasizes the formulation step, and discusses numeric and analytic solution techniques for solving sets of algebraic equations and for solving ordinary and partial differential equations. *Prereq.* Senior standing.

CHE 1512 Chemical Process Control 4 QH

Topics include the Laplace transform and its use in solving ordinary differential equations; modeling and computer simulation of basic heat, mass, and fluid-flow dynamics; linearization of nonlinear systems; the transfer function; sensors, transmitters, valves, and controllers; block-diagram algebra; dynamics of higher-order systems; modeling and simulation of control-loop dynamics; frequency response; and Laplace and frequency domain stability analysis. *Prereq.* Senior standing.

CHE 1513 Introduction to Optimization 4 QH

Demonstrates elementary optimization techniques, such as gradient methods, pattern search, linear programming, and dynamic programming, as applied to a variety of elementary physical and chemical problems. *Prereq.* Senior standing.

CHE 1514 Special Topics 4 QH

Presents chemical engineering topics of interest to the staff member conducting the class. *Prereq.* Senior standing.

CHE 1516 Mass Transfer Operations 4 QH

Focuses on the mass transfer operations of crystallization, absorption, chromatography, ion exchange, and membrane separations. *Prereq.* Senior standing.

CHE 1519 Kinetics of Polymer Science

Introduces polymers and polymer science. Explores polymer synthesis and reactions, thermodynamics and kinetics of polymerization, and physical characterization of polymers. Investigates the molecular structure, properties, and applications of polymers, as well as processing and testing. *Prereq.* CHE 1421 and CHM 1272.

CHE 1520 Pollution Control in Chemical Industries 4 QH

Studies fundamental operations for handling environmental problems in the chemical process industries. Discusses water quality requirements and industrial waste characteristics. *Prereq.* Senior standing.

CHE 1521 Chemical Process Development 4 QH

Traces the manner in which a chemical process evolves from the research lab to full-scale production using typical processes as illustrations. Topics covered include economic factors, safety factors, batch vs. continuous operation, process evaluation, developing the flow sheet, and scale-up considerations. *Prereq.* Senior standing.

CHE 1523 Catalysis 4 QH

Introduces heterogeneous catalytic processes. Topics include mechanistic explanations, modeling of catalyzed reactions, and the application of catalysts to industrial practice. *Prereq.* Senior standing.

CHE 1530 Biochemical Engineering Fundamentals 4 QH

Presents key concepts in biochemistry, cell biology, enzyme kinetics, and metabolic pathways, offered as an introductory exposure to these topics and not as complete coverage of life science fundamentals. Topics include biological reactor kinetics and design, transport phenomena in bioprocess systems, and process instrumentation/control. *Prereq.* Open to seniors only.

CHE 1777 Honors Adjunct 1 QH

To be added to any 4 QH course in the department when approved by the Honors Committee of The College of Engineering. Once approved, the adjunct information is forwarded to the Honors Office for dissemination to the honors membership. Students may enroll in CHE 1777 an unlimited number of times as it can be adjunct to any chemical engineering course.

Civil Engineering

The course descriptions listed under civil engineering are intended to show the general scope of the subject that will be covered. Since courses are continually updated, specific topics or methods of approach may vary from term to term.

CIV 1210 Structural Mechanics 1 **4 QH**

Topics include statics of particles and rigid bodies in two and three dimensions; analysis of internal forces in trusses and beams; centroids and centers of gravity of lines, area, and volumes; and moments of inertia of areas and masses. *Prereq.* MTH 1227 concurrently and PHY 1222.

CIV 1211 Structural Mechanics 2 **4 QH**

Surveys analysis of stress and strain; mechanical properties of materials; elastic analysis of stresses and deformations of members subject to axial load, torsion, shear, and moment. Introduces column behavior. *Prereq.* CIV 1210.

CIV 1212 Structural Mechanics 3 **4 QH**

Continues CIV 1211. Topics include torsion, general bending, curved members, shear flow, shear center, combined stresses including elastic and plastic behavior, continuation of column buckling. Introduces yield and fracture criteria. *Prereq.* CIV 1211.

CIV 1220 Structural Analysis 1 **4 QH**

Reviews reactions, shear and bending moment diagrams, bar forces in trusses, deflections by virtual work, and moment area methods. Analyzes indeterminate structures by consistent deformations, slope deflection, and moment distribution. *Prereq.* CIV 1211.

CIV 1222 Structural Analysis 2 **4 QH**

Focuses on matrix analysis of indeterminate structures using both flexibility and stiffness approaches. Examines computer applications to analysis of framed structures. *Prereq.* CIV 1220.

CIV 1224 Structural Analysis 3 **4 QH**

Continues CIV 1220. Topics include slope deflection; moment distribution; effects of axial loads; symmetry; antisymmetry; nonprismatic members; influence lines for determinate and indeterminate structures, approximate methods of lateral load analysis; and shear wall action. *Prereq.* CIV 1220.

CIV 1226 Structural Analysis and Design Laboratory **2 QH**

Uses lectures, experimental studies, computation labs, and computer projects to develop students' knowledge of structural behavior and understanding of the design and analysis of structures. *Prereq.* CIV 1220 taken concurrently.

CIV 1240 Design of Reinforced Concrete Structures 1 **4 QH**

Reviews mechanical properties of steel and concrete. Studies behavior and design of reinforced concrete beams for shear, moment, and

bond; and design of stocky columns for axial load and moment. Emphasizes strength design. *Prereq.* CIV 1220.

CIV 1241 Design of Reinforced Concrete Structures 2 **4 QH**

Topics include design of slender columns, foundations, and multistory buildings with one-way and two-way floor systems. *Prereq.* CIV 1240.

CIV 1250 Design of Steel Structures 1 **4 QH**

Focuses on design of steel members subject to tension, compression, bending, and combinations of loading; and design of connections, braced frames, and rigid frames. *Prereq.* CIV 1220.

CIV 1251 Design of Steel Structures 2 **4 QH**

Topics include design of steel plate girders, composite construction in bridges and buildings, plastic analysis and design, and the design of high-rise buildings subject to lateral loads. *Prereq.* CIV 1250.

CIV 1295 Structural Design Projects **4 QH**

Capstone structural design course. Consists of a minimum of two projects that consider environmental, social, and economic impact. Discusses the safety requirements of various government agencies. Projects require identification of design loading, assessment of structural stability, material usage, and the reliability of the proposed design. Employs computer-aided designs and verifies the results by approximate methods. Considers and analyzes economics of alternative designs. *Prereq.* CIV 1222, CIV 1241, CIV 1251; open to seniors only.

CIV 1310 Fluid Mechanics **4 QH**

Introduces both the statics and dynamics of fluid mechanics. Topics include properties of fluids; pressure variation in water and air; pressure force on surfaces and submerged bodies, continuity, momentum, and energy principles; dimensional analysis and hydraulic similitude; flow in closed conduits, frictional and local losses in pipes and systems; and problems in steady flow. *Prereq.* CIV 1210.

CIV 1320 Hydraulic Engineering **4 QH**

Covers a variety of topics including pipe networks; water hammer; pumps and pump selection; pipe/pump combinations; flow in open channels, uniform flow, gradually varied flow, and hydraulic jump; drag forces on bodies; principles of hydrology, unit hydrograph, and rainfall-runoff relationships; and some aspects of ground water and well hydraulics. *Prereq.* CIV 1310.

CIV 1340 Environmental Engineering I 4 QH

Focuses on protection and management of the environment. Topics include assessment of environmental quality; introduction to water and wastewater technology; air pollution control; and solid waste management. *Prereq. CHM 1132.*

CIV 1341 Environmental Engineering 2 4 QH

Concentrates on development of fundamental physical, chemical, and biological phenomena of water and wastewater systems with engineering applications in water technology from source to ultimate disposal. *Prereq. CIV 1310 and CIV 1340.*

CIV 1350 Environmental and Hydraulics Laboratory 4 QH

Presents lectures, labs, and field experiments in environmental and hydraulic engineering. Experiments in hydraulics include fluid properties; hydrostatics; drag forces; and flow in pipes, channels, pumps, and turbines. Environmental experiments include physical, chemical, and biological analyses normally used by environmental engineers. Field experiments are coordinated to allow collection of environmental and hydraulic data concurrently. *Prereq. CIV 1340; CIV 1320 concurrently.*

CIV 1370 Air Pollution 4 QH

Focuses on theory and practice related to engineering management of air resources. Surveys microclimate and dispersion of pollutants; atmospheric chemistry; air pollution instrumentation; control of gaseous and particulate emissions; design of air pollution control systems; and biological and chemical aspects of air pollution with emphasis on the toxicological aspects of the environment. Other topics include the physiological effects of aerosols; analysis of organic and inorganic constituents of the atmosphere; and rationale for establishment of air quality criteria and standards. *Prereq. Seniors only.*

CIV 1395 Environmental Design Projects 4 QH

Capstone design course in the field of environmental engineering. Up to six individual design projects are assigned, typically involving water and/or waste treatment, site development, industrial waste handling, chemical treatment, and the modification of existing facilities. Each is given a careful critique. Designs require input relating to environmental protection and impact, economic factors, engineering feasibility, selection from alternatives, and safety consideration. One project requires an oral presentation. *Prereq. CIV 1320, CIV 1341, CIV 1350, open to seniors only.*

CIV 1410 Soil Mechanics 4 QH

Studies soil classification, soil-water phase relations, ground water seepage, consolidation theory, strength properties of soils, stress distributions in soils due to surface loads, and slope stability. *Prereq. CIV 1211 and CIV 1310.*

CIV 1411 Soil Mechanics Laboratory 2 QH

Focuses on lab exercises, including soil classification, seepage, shear strength, consolidation, and triaxial testing. *Prereq. CIV 1410 taken concurrently.*

CIV 1420 Foundation Engineering 4 QH

Topics include subsurface explorations, determination of soil-bearing capacity, design of shallow foundations, pile and caisson foundations, design of retaining walls, anchored bulkheads and braced sheeting, and other selected topics on foundation design and construction. *Prereq. CIV 1410.*

CIV 1430 Geotechnology 4 QH

Introduces the geological sciences as they apply to civil engineering practice. Focuses on the effects of significant geological features on location, design, construction, operation, and maintenance of engineering projects. *Prereq. Juniors and seniors only.*

CIV 1495 Geotechnical Design Projects 4 QH

Capstone design course for those interested in the geotechnical area. Two or more projects involving the various aspects of analysis and design used in geotechnical practice will be done as an individual and/or group effort. The projects will require evaluation of subsurface conditions, identification of critical issues, assessment of environmental impacts, economics, safety, construction sequencing, and construction feasibility. They may also include structural design. Examples include design of foundations for super-structures, temporary earth retaining systems for deep excavations, and permanent earth support walls for deep earthen cuts. *Prereq. CIV 1420, CIV 1550, open to seniors only.*

CIV 1510 Materials 4 QH

Focuses on the structural, chemical, and mechanical properties of materials of importance to civil engineers. Topics include fundamental nature of matter; significance of phase transformations; control of microstructure; and the mechanisms of failure of materials. *Prereq. CHM 1132.*

CIV 1511 Materials Laboratory 2 QH

A lab in which standard tests and equipment are used to determine structural and mechanical properties of materials common to civil engineering practice: concrete, aggregates, steel, wood, asphalt, glass, and others. *Prereq. Taken concurrently with CIV 1510.*

CIV 1530 Transportation Analysis and Planning 4 QH

Covers history and policy issues in urban transportation: characteristics of different urban transportation models; fundamentals of bus and rail transit operations planning; fundamentals of urban highway operation; transportation systems management; and land use and demand modeling. Other topics include environmental impact

assessment, citizen participation, data collection, and transportation in developing countries.

Prereq. Juniors and seniors only.

CIV 1540 Highway Engineering 4 QH

Introduces highway engineering. Topics include administration, economic factors, planning, environmental impacts, geometric design, drainage, and the design of flexible pavements.

Prereq. CIV 1410 and CIV 1620.

CIV 1550 Construction Management 4 QH

Surveys the construction industry and tasks that must be addressed by construction management, including resource allocation, construction environment, organization, contracts, funding, cash flow, productivity, labor relations, network planning and scheduling, construction accounting, and project control. *Prereq. Seniors only.*

CIV 1595 Transportation Design Projects 4 QH

Capstone design course in transportation. Projects involve planning/design of modified transportation facilities and services. Topics include demand estimation, highway design, traffic flow, safety, economic and social considerations, environmental impacts, and transit fleet size requirements. Examples of such projects are planning for a new highway, transportation systems management planning for an existing corridor, and design of an intermodal transfer facility. *Prereq. CIV 1530, CIV 1540, CIV 1640, open to seniors only.*

CIV 1620 Engineering Measurements 4 QH

Considers the mathematics and instrumentation used in land surveying for obtaining measurements of distance, elevation, and direction. Covers the methodology applied for traverses, areas, coordinate systems, horizontal and vertical curves, earthwork, and topographic mapping. *Prereq. MTH 1124 and PHY 1222.*

CIV 1621 Engineering Measurements Laboratory 2 QH

Examines field problems illustrating and applying the lecture material in CIV 1620, with computer applications. Taken simultaneously with CIV 1620. *Prereq. GE 1100.*

CIV 1625 Civil Computations Laboratory 1 QH

Students will design and execute applications programs for materials covered in CIV 1640 and other courses for a wide variety of civil engineering problems. Some new civil engineering applications topics will also be investigated. *Prereq. CIV 1640 taken concurrently and GE 1100.*

CIV 1630 Civil Engineering Systems 4 QH

Covers application of system synthesis and optimization techniques: calculus method, linear programming, network analysis, and dynamic programming. *Prereq. MTH 1227.*

CIV 1640 Applied Probability Theory for Civil Engineers 4 QH

Topics include applications of probability theory to civil engineering problems, probabilities of events, random variables and distributions, derived distributions, expectation, common probability models, and an introduction to statistics. *Prereq. MTH 1227.*

CIV 1650 Legal Aspects of Civil Engineering 4 QH

Introduces business law for engineering organizations, including description and evaluation of various types of contracts for engineering services and construction, procedures for submitting bids, procedures for claims, and legal steps to minimize risk exposure, both in United States and international business. *Prereq. Seniors only.*

CIV 1665 Professional Issues for Civil Engineers 4 QH

Focuses on concepts and theories of classical and contemporary ethics, moral development theories, and developing and applying professional ethics in engineering. Traces the development and philosophies of professional engineering societies. Covers the requirements and responsibilities of professional registration.

CIV 1777 Honors Adjunct 1 QH

To be added to any 4 QH course in the department when approved by the Honors Committee of the College of Engineering. Once approved, the adjunct information is forwarded to the honors office for dissemination to the honors membership. Students may enroll in CIV 1777 an unlimited number of times as it can be adjunct to any civil engineering course.

CIV 1810 Special Topic in Civil Engineering 4 QH

This is a special course within the field of civil engineering initiated by the appropriate discipline committee and approved by the department. *Prereq. Permission of instructor.*

CIV 1820 Special Project in Civil Engineering 4 QH

Offers individual study in an area within the field of civil engineering, selected by the student and his or her instructor with approval by the appropriate discipline committee, resulting in a definitive report and an oral presentation. *Prereq. Outstanding academic performance.*

Electrical Engineering

The course descriptions listed under electrical engineering are intended to show the general scope of the subject that will be covered. Since courses are continually updated, specific topics or methods of approach may vary from term to term.

ECE 1171 Electrical Engineering 1

4 QH

Introduces electric circuit theory. Covers Kirchhoff's laws, loop and nodal analysis, Thevenin's theorem, power and energy, exponential excitation, and the system function. *Prereq.* MTH 1128; *not open to electrical engineering majors.*

ECE 1215 Circuits and Systems 1

4 QH

Topics include electric circuit elements, sources, Kirchhoff's laws, Tellegen's theorem, Thevenin's theorem, mesh and node equations, power and energy, linearity and time invariance, response to exponential excitations, and system function. *Prereq.* MTH 1125 and PHY 1223.

ECE 1216 Circuits and Systems 2

4 QH

Topics include forced and force-free response of networks, singularity response, "pre-box" concept, classical a-c response, application of Laplace transform to circuit problems and determination of initial conditions, and the driving-point and transfer functions of circuits. *Prereq.* ECE 1215.

ECE 1217 Circuits and Systems 3

4 QH

Demonstrates power and energy, reciprocity, magnitude and phase plots, and n-port network theory. Analyzes frequency domain analysis of circuits, stability considerations; and the concept of state variables for networks, natural frequencies, and eigenvalues. *Prereq.* ECE 1216 and MTH 1225.

ECE 1221 Measurements Laboratory

1 QH

Covers fundamentals of electrical measurements and instrumentation. Topics include electrical characteristics of meter movement and its use in designing ammeters and voltmeters; sources of DC current and voltage and their characteristics; the oscilloscope and its application to the display of waveforms and I-V curves of the two-terminal devices; and the measurements of amplitude, phase, and time interval. Lab fee. *Take ECE 1215 concurrently.*

ECE 1222 Circuits Laboratory 1

1 QH

Offers experiments in basic circuits and measurement. Topics include AC waveforms and circuits for the measurement of peak, average, and rms values; network theorems, that is, Thevenin and Norton, their application and experimental verification; and null circuits such as the Wheatstone bridge and potentiometer. Discusses characterization of simple LTI circuits including RL, EC, and RLC by investigation of their step response and impulse response. Lab fee. *Take ECE 1216 concurrently.*

ECE 1223 Circuits Laboratory 2

1 QH

Lab experiments include controlled sources sinusoidal excitation of first order RC and second order RLC networks; the determination by measurement of magnitude and phase (Bode) plots; and investigation of the resonance phenomenon. Lab fee. *Take ECE 1217 concurrently.*

ECE 1224 Electronics Laboratory 1

1 QH

Follows from ECE 1346. Experiments include p-n junctions and diodes, regulation and power supplies, transistor biasing and bias stability, and MOS digital circuits. *Prereq.* ECE 1346. *Take ECE 1347 concurrently.*

ECE 1225 Electronics Laboratory 2

1 QH

Follows from ECE 1347. Experiments designing and verifying basic analog circuit functions utilized in integrated circuits. Advantages inherent to ICs, such as component matching and tracking, are exploited in the circuit building blocks investigated. Studies output power stages, current sources, amplifying stages, and differential amplifiers. Topics include applications to signal amplification, D-to-A conversion, and the extraction of weak signals buried in interference. Lab fee. *Prereq.* ECE 1347. *Take ECE 1349 concurrently.*

ECE 1226 Discrete Systems Laboratory

1 QH

Utilizes a personal computer to study and explore various aspects of A/D and D/A conversion such as aliasing and quantization and some aspects of discrete Fourier transforms and digital filters. Lab fee. *Take ECE 1333 concurrently.*

ECE 1227 Electromagnetic Fields Laboratory 1

1 QH

Lab designed to support class material related to microwave transmission and radiation. Experiments include microwave transmission line measurements and the determination of the properties of dielectric materials; transmission line length measurement; reflection and impedance measurement of dipole antenna; frequency characteristics of antennas and waveguides; and mutual coupling and radiation pattern determination. Lab fee. *Take ECE 1364 concurrently.*

ECE 1228 Electromagnetic Fields and Energy Conservation Laboratory 2

1 QH

Presents static and quasi-static (low frequency) applications of electromagnetic fields and electromechanical energy conversion. Experiments in electromagnetic fields include measurement of static electric potentials in electrode structures and numerical solution of Laplace's equation and static magnetic field measurements

of coil configurations. Experiments in energy conversion include transformers and induction motors. Investigates hysteresis, transformer and motional emfs, and development of electromagnetic torque. Lab fee. *Take ECE 1365 concurrently.*

ECE 1229 Digital Systems Laboratory 1 QH
Introduces some aspects of computer hardware design encountered at the digital logic level. Discusses both combinational logic and sequential logic units. Focuses on MSI devices including multiplexers, decoders, counters, shift registers, PROM, RAM, and ALU. Demonstrates the design of Mealy and Moore sequence detectors and other digital subsystems such as parallel binary divider. Lab fee. *Coreq. ECE 1382.*

ECE 1230 VLSI System Design Laboratory 2 QH
Examines the design, layout, and simulation of digital VLSI circuits using a comprehensive set of CAD tools. Studies layouts of NMOS and CMOS combinational and sequential circuits using either a layout editor or automatic layout generators. Studies functional structures including registers, adders, decoders, ROM, PLAs, counters, RAM, and ALU. Utilizes logic and circuit simulators for the logic verification and timing simulation of designed circuits. Lab fee. *Take ECE 1351 concurrently.*

ECE 1231 Electric Power Laboratory 1 1 QH
Presents a power systems design project encompassing one or more of the following computer studies: transmission line constants, power flow, short circuits, and transient stability. Uses a personal computer to upgrade the design of a small power system. Lab fee. *Take ECE 1472 concurrently.*

ECE 1232 Electric Power Laboratory 2 2 QH
Lab experiments cover topics in electromechanical energy conversion employing the "Faraday Law machine" bench. Studies Faraday's Law, transformers, reluctance and induction motors, and synchronous machines. Lab fee. *Prereq. ECE 1472 and coreq. ECE 1371.*

ECE 1233 Semiconductor Processing Laboratory 2 QH
Covers fabrication and testing of simple MOS integrated circuits. Compares process and device models introduced in ECE 1406 with experimental results during weekly lab sessions. Processing includes oxidation, diffusion, lithography, etching, metallization, and characterization. Fabricated diodes, MOS capacitors and transistors, and simple gates will be electrically characterized. Lab fee. *Take ECE 1406 concurrently.*

ECE 1234 Digital Signal Processing Laboratory 2 QH
Focuses on programming a digital signal processing chip in its native assembly language, and performing input/output operations via A-to-D and D-to-A converters. Studies real time signal processing operations and hardware aspects of DSP systems. Considers applications to digital

frequency synthesis, computation of discrete time convolution, speech scrambling through frequency inversion, and design and implementation of both FIR and IIR digital filters. Lab fee. *Take ECE 1456 concurrently.*

ECE 1235 Control Systems Laboratory 1 QH
Lab experiments familiarize the student with the practical aspects of control systems design. Topics include analog computer simulation, digital computer control, and use of a programmable controller. Experiments with PID control and emphasizes computer implementation of feedback compensations. Lab fee. *Take ECE 1420 concurrently.*

ECE 1332 Linear Systems 1 4 QH
Focuses on basic concepts and techniques of continuous linear system theory. Topics include system theory in terms of the convolution integral; waveform representation in terms of the Fourier series, Fourier integral, and the bilateral Laplace transform; system concepts in terms of the system function and their application to filters and feedback systems. *Prereq. ECE 1217.*

ECE 1333 Linear Systems 2 4 QH
Topics include historical review and future perspectives of discrete systems; representation of digital signals, sampling, quantization; introduction to digital filters, moving average filters; Z-transforms, inverse Z-transforms; recursive digital filters, stability considerations; and steady-state and transient response. Introduces nonrecursive techniques, the discrete Fourier transform, the fast Fourier transform, and applications to computation of systems transfer functions. *Prereq. ECE 1332.*

ECE 1346 Electronics 1 4 QH
Emphasizes the use of solid-state active devices in digital circuits. Introduces binary values, logic operations, flip-flops, and registers from the viewpoint of symbolic logic gates, Boolean algebra and Karnaugh maps. Other topics include solid-state devices for the realization of logic functions; concepts of diodes; BJT and field-effect characteristics leading to the use of such devices in implementing inverters, NAND and NOR gates for T²L, CMOS and NMOS logic families. *Prereq. ECE 1216.*

ECE 1347 Electronics 2 4 QH
Emphasizes the use of transistors, including integrated devices in the design of analog circuits. Topics covered include biasing, linearized incremental model characteristics such as gain and impedance levels, early effect, use of signal flowgraphs and frequency response for single and compound stages, and an introduction to operational amplifiers. *Prereq. ECE 1346.*

ECE 1349 Electronic Design 1 4 QH
Studies the design of analog circuits with emphasis on operational amplifiers. Topics include

concepts of feedback, open- and closed-loop gain, effect of feedback on impedance levels, frequency response, and stability and compensation in feedback systems. Introduces ECL from the viewpoint of feedback, followed by an analog/digital design example. *Prereq.* ECE 1347.

ECE 1350 Electronic Design 2 4 QH

Continues ECE 1349. Emphasizes the design of systems involving analog, digital and analog/digital approaches to signal acquisition and processing. *Prereq.* ECE 1349.

ECE 1351 Special Topics in IC Design 4 QH

Offers a structured digital MOS design course in designing, verifying, and fabricating both NMOS and CMOS VLSI integrated circuits. Introduces required design rules and relates them to the fabrication process. Begins design exercises and tutorials with basic inverters and proceeds to the design, verification, and performance of large complex digital logic networks. Develops a simple RD delay model in conjunction with the theory of delays in VLSI systems. Other topics covered include program logic arrays and automatic design tools, shift registers, arithmetic logic units, and memory systems. *Prereq.* ECE 1382. *Take ECE 1230 concurrently.*

ECE 1363 Electromagnetic Field Theory 1 4 QH

Starting with Maxwell's equations, studies the major areas of statics, dynamics, quasi-statics, and material media. Statics covers the study of the electrostatic and magnetostatic fields, including the scalar electric potential and vector magnetic potential. In dynamics, presents Faraday's law and Ampere's law for time-varying electromagnetic fields. Quasi-statics introduces the concept of electromechanical coupling with applications to elementary energy conversion, both electric and magnetic devices. Material media covers the macroscopic model of dielectric materials; the electric polarization and the electric flux density vector; macroscopic model of magnetic materials, magnetization, and magnetic field intensity; and boundary conditions. *Prereq.* MTH 1225 and PHY 1223.

ECE 1364 Electromagnetic Field Theory 2 4 QH

Introduces the applications of electromagnetic field theory. Based on Maxwell's equations for time-varying fields, develops the following areas: waves and energy, including plan wave propagation, waveguides and Poynting's theorem; radiation, with emphasis on spherical waves and elementary scattering and application to antenna design; distributed systems terms of waveguide circuit concepts, transmission lines, and Smith chart techniques. Presents other applications in the optics and acoustics areas. *Prereq.* ECE 1363.

ECE 1365 Electromagnetic Fields and Energy Conversion 4 QH

Focuses on the static and quasi-static solution of the electromagnetic field equations and empha-

sizes energy conversion and transducers. Topics include electrostatics; dielectric materials and transducers; magnetostatics; magnetic materials and transducers; and magnetic circuits, transformers, and energy conversion concepts applied to DC, synchronous, and induction machines. *Prereq.* ECE 1364.

ECE 1371 Electrical Machines 1 4 QH

Reviews electromagnetic field theory as applied to electromechanics. Discusses magnetic circuits, transformers, and their circuit representations; principles of electromechanical energy conversion (state-variable formulation of electromechanical coupling, singly and multiply excited magnetic-field systems; elementary concepts of rotating machines including transformer emf, speed emf, and torque production); steady-state theory and performance of basic rotating machines such as induction, synchronous, and DC commutator machines through circuit-model concepts. *Prereq.* ECE 1365.

ECE 1372 Electrical Machines 2 4 QH

Covers dynamic behavior of electromechanical devices; transient performance of synchronous machines; synchronous and induction-machine dynamics; and DC machine dynamics. *Prereq.* ECE 1371.

ECE 1379 Transients in Electric Power Systems 4 QH

Introduces transient response in electrical power systems. Topics include lightning; switching; faults; and protection against transient overvoltages. Considers transmission lines, transformers, circuit breakers, surge arresters, and fuses in terms of transient response. *Prereq.* ECE 1333.

ECE 1381 Computer Engineering 1: Introduction to Computer Architecture 4 QH

Presents a view of the architecture of a modern computer; the visible architecture provides the starting point. Assembly language programming is used to develop a foundation on the hardware which executes a program and shows what a compiler, assembler, and linker do and how they interact with the architecture. Explores data structures from a programmatic perspective (static storage, stack, and heap) and from a high-level language perspective (simple data types, and structured data types). Covers several types of computer number systems and arithmetic (2s-complement, IEEE floating point, and logical operations). Includes numerous programming exercises and a software design project to develop working facility with the tools and concepts that underlie the next three computer engineering courses. *Prereq.* GE 1100 or equiv.

ECE 1382 Computer Engineering 2: Design of Digital Logic Machines and Circuits 4 QH

Continues ECE 1381 with a bottom-up view of the design of logic machines, leading to the design of a simple digital computer by the end of the quarter.

Covers Boolean switching algebra and gate-count minimization; combinational design; sequential circuits; state machines; PLA, PAL, and ROM realizations; CPU design, design of the ALU, and control unit design. Introduces CAD logic design tools. Requires a design project using SSI and MSI chips to develop facility in the design and testing of functional digital circuits. Proof of the circuit will be done using the CAD tools. *Prereq.* ECE 1381.

ECE 1383 Computer Engineering 3: Microprocessor-Based Design **4 QH**

Focuses on the hardware design for modern microprocessor systems. Topics include microprocessor systems architecture; HP64000 microprocessor development system; support circuits; microprocessor busses; electrical characteristics and buffering; memory systems, memory maps, and address decoding; timing in microprocessor systems; asynchronous and synchronous bus protocols; and troubleshooting microprocessor systems. Covers I/O-port design and interfacing using VLSI devices; parallel and serial ports; communication protocols and synchronisation to external devices; hardware and software handshake; serial communication protocols; and RS 232C, RS 422, and RS 423 serial interface standards. Investigates exception processing and interrupt handlers, interrupt generation, interfacing, and vectoring. Includes comprehensive lab exercises that let groups of three students build a modern microprocessor system and execute a small project that enhances the system with useful hardware or software. *Prereq.* ECE 1382.

ECE 1384 Computer Engineering 4: Hardware and Software for Microprocessor Interfaces **4 QH**

Focuses on the interaction of software and hardware necessary to interface microprocessor systems to the real world. Topics include special-purpose I/O devices; timers; D/A and A/D converters; DMA controllers, and disk controllers. Surveys bus design and bus protocols: VME bus, IEEE-488 (GPIB) instrument bus, small computer system interface (SCSI) bus. Analyzes real-time programming; I/O techniques, event-handling delays, and data throughput rates. Considers BIOS, monitors, simple operating systems, multitasking, and memory management. Most of the course is taught in the context of one modern microprocessor, but other microprocessors will also be discussed. Includes several lab exercises and a project implementing hardware and software for a complex microprocessor interface. *Prereq.* ECE 1383.

ECE 1385 Computer Engineering 5: Introduction to Robotics **4 QH**

Studies intelligent interactions between machines and their environment with emphasis on sensory (vision)-driven locomotion and manipulation.

Examines integration of sensors, manipulators, and computers into intelligent robotic systems. Demonstrates vision, touch, force, position, proximity, and torque sensors and their role in adaptive control of robot movements. Other topics include computational needs of sensory data processing; VLSI implementation of data-driven architectures for low-level vision; image processing and understanding as a means of developing symbolic models of the visual (sensory) world; manipulator kinematics and dynamics; VLSI controllers for multicoordinate robotic systems; robotic software tools, including high-level language and decision-making functions; and real-time microprocessor networks and control hierarchies within the robot. *Prereq.* ECE 1333, ECE 1382, and ECE 1383.

ECE 1386 Computer Engineering 6: Structure of Large-Scale Computer Systems **4 QH**

Studies large-scale computer systems with applications to robotics, communications, artificial intelligence, and interactive computer design. Covers a global overview of distributed and parallel computing systems for problem solving, planning, and massive data processing. Examines special purpose processors that constitute such complex systems including parallel hardware for image processing, industrial data acquisition and control systems, array processors, and knowledge-based systems. *Prereq.* ECE 1384.

ECE 1390 Senior Project Laboratory 1 **2 QH**

In this course, students work with a faculty adviser on a term project, either experimental or theoretical. *Prereq.* Permission of department.

ECE 1391 Senior Project Laboratory 2 **2 QH**

Continues the project started in ECE 1390 or it may be a new project. *Prereq.* Permission of department.

ECE 1400 Special Topics **4 QH**

Topics covered vary from term to term depending on the interests of the department and the students. *Prereq.* Permission of department.

ECE 1401 Selected Topics In Electronics **4 QH**

Covers the description and application of those electronic devices (thyristors, photodiodes) not covered in depth in the regular electronics sequence; electronic subsystems (AFC, shift registers); and systems (navigation systems, telephone switching systems). Most of the presentations are chosen and made by students, but there are also lectures by invited speakers by the instructor. *Prereq.* ECE 1347.

ECE 1406 Integrated Circuit Fabrication **4 QH**

Surveys microelectronics from crystal growth to interconnection and packaging. Topics include crystal growth and epitaxy; silicon oxidation kinetics and film depositions; photolithography;

and diffusion and ion implantation. Discusses the p-n junction diode, the diode equation, and p-n junction fabrication. Reviews metalization techniques, metal oxide semiconductor systems, MOS capacitor and MOS transistor, and VLSI fabrication technologies (bipolar nMOS cMOS). *Prereq. ME 1386.*

ECE 1408 Physical Electronics 4 QH

Develops elements of solid-state theory including wave mechanics, crystalline and amorphous solids, statistical mechanics, and electron transport theory to provide background for a thorough understanding of the junction diode. Explores ohmic contacts and Schottky barriers and the ways that these may be generated in individual and integrated form. Demonstrates how these elements are joined together to form BJTs and JFETs. *Prereq. ME 1386.*

ECE 1420 Control Systems 4 QH

Comprises closely coupled lectures and laboratory experiments. Topics covered include control system concepts, basic components and goals, modeling and mathematical description, transfer function and state variable representations, feedback control system characteristics, system responses, stability of feedback systems, analysis of graphical tools such as root-locus and Nyquist diagram, compensator design based on root-locus and frequency response, and modern control system design. *Prereq. ECE 1332 and ECE 1347.*

ECE 1430 Electrical Engineering Power Laboratory A 1 QH

ECE 1454 Communication Systems 4 QH

Explores signal representations and characterization; characterization of thermal noise in electronic circuits; amplitude modulation and demodulation; frequency and phase modulation and demodulation; pulse modulation; and transmission of digital information. *Prereq. ECE 1333 and MTH 1384.*

ECE 1456 Digital Signal Processing 4 QH

Introduces modern signal processing. Reviews discrete signals and systems; realization structures for digital filters, including direct forms, cascade forms, and parallel forms; digital filter design, including IIR filter design using impulse invariance and bilinear transformation; and FIR filter design using windowing and frequency sampling. Covers fast Fourier transforms; decimation-in-time and decimation-in-frequency; applications to fast convolution; and implementation of DSP algorithms, including finite word length effects, special purpose hardware to applications in speech processing, and spectral estimation. *Prereq. ECE 1333.*

ECE 1462 Advanced Topics in Electromagnetic Field Theory 4 QH

Continues the required courses in field theory. Topics include microwave and waveguide structures; careful development of electromag-

netic energy and force concepts; and an introduction to radiation and antenna theory. *Prereq. ECE 1364.*

ECE 1465 Wave Transmission and Reception 4 QH

Discusses the transmission, radiation, and reception of electromagnetic waves at and above radio frequencies. Develops transmission-line theory using Maxwell's equations and the circuit theory approximations. Discusses matched lines, tuning stubs, and loaded transmission lines, together with the theory and applications of the Smith chart. Presents the theory of guided waves in structures of rectangular and circular cross-section followed by the theory of the cavity resonator. Other topics include the linear antenna, radiation fields, directivity, gain, the aperture antenna, and the insulated antenna. *Prereq. ECE 1364.*

ECE 1466 Optics of Photon Devices 4 QH

Presents the basic optical concepts necessary for an understanding of quantum electronic devices. Analyzes the simple Lorentzian model of the interaction between electromagnetic waves and optical materials, modified to include necessary quantum concepts. Topics include propagation of electromagnetic waves in isotropic and nonisotropic media (crystal optics); reflection and refraction, polarization and double refraction; optical resonance and stability criteria; Gaussian beam propagation; systems with gain; coherent and noncoherent optical sources; and detection of optical signals. Considers specific devices including resonators, amplifiers, and oscillators; modulators and switches; and optical detectors. *Prereq. ECE 1364.*

ECE 1471 Electrical Power Systems 1 4 QH

Introduces electrical power systems, wherein three-phase circuits are analyzed under balanced steady-state operation. Topics include system elements and their characteristics and interaction; system modeling; and network calculations. *Prereq. ECE 1332.*

ECE 1472 Electrical Power Systems 2 4 QH

Continues basic studies in electrical power systems. Topics include power system load-flow analysis; symmetrical components and fault calculations; system protection; economic operation of power systems; and an introduction to power system stability. *Prereq. ECE 1471.*

ECE 1474 Power Electronics 4 QH

Presents the application of semiconductor devices to power supplies and to AC and DC motor drives. Examines power semiconductor devices including silicon-controlled rectifiers (SCR), gate turn-off thyristors (GT), high-power bipolar junction transistors (HPBT), and power MOS field-effect transistors (MOSFET). Reviews characteristics of AC and DC motors and establishes motor drive

requirements. Studies applications of rectifiers, inverters, choppers, and cycloconverters. *Prereq. ECE 1347 and ECE 1365.*

ECE 1481 Machine Language and Assembly Language Programming **4 QH**

Focuses on study of the machine and assembly languages of a selected digital computer. Covers machine representation of numbers, characters, and instructions; machine language programming: flow of control, relocatability, input/output instructions, addressing, and instruction modification. Traces symbolic assembly language: macros, literals, and pseudo-instructions. Includes several programming projects. *Prereq. ECE 1381.*

ECE 1482 Programming Systems **4 QH**

Continues ECE 1481. Discusses assemblers, searching and sorting techniques, and macroprocessors loaders. Introduces high-level languages and their compilation, and operating systems. Includes programming projects as an integral part of the course. *Prereq. ECE 1481.*

ECE 1484 Applied Discrete Analysis **4 QH**

Introduces elementary number theory, modern algebra, combinatorial mathematics and discrete probability theory, including prime numbers, least common multiple, and greatest common divisor. Covers Euclid's algorithm, continued fractions, congruences, groups, rings, fields, Boolean algebra, combinations and permutations, generating functions, random variables, and Markov chains. *Prereq. MTH 1225.*

ECE 1486 Numerical Methods and Computer Applications **4 QH**

Presents numerical techniques used in solving scientific and engineering problems with the aid of digital computers. Topics include modeling and simulating of deterministic and probabilistic systems; theory of interpolation; iteration methods; numerical solution of ordinary and partial differential equations; signal detection; and use libraries of scientific subroutines. Chooses representative problems for solution on a digital computer. *Prereq. ECE 1332 and GE 1100.*

General Engineering

The course descriptions listed under general engineering are intended to show the scope of the subject that will be covered. Since courses are continually updated, specific topics or methods of approach may vary from term to term.

GE 1100 Computers for Engineers **4 QH**

Uses computers to solve engineering problems emphasizing "structured programming" and Pascal. Explores methods of forming and testing an algorithm; introduces software design methods, forming a subprogram and communicating with a subprogram. Topics include establishing and manipulating tables, arrays and matrices, demonstrating how to use a typical numerical methods package—the Turbo Toolbox—to solve advanced engineering problems.

GE 1110 Engineering Graphics and Design **4 QH**

Examines manual and computer methods for depicting three-dimensional objects. Presents the orthographic projection system using principal and auxiliary views; analysis of drawings; fundamentals of manufacturing processes; and dimensioning practice. Emphasizes engineering design of components and systems, and computer graphics using software packages. Requires writing programs as an introduction to computer-aided design and manufacturing, and preliminary to design engineering.

Industrial Engineering

The course descriptions listed under industrial engineering are intended to show the general scope of the subject that will be covered. Since courses are continually updated, specific topics or methods of approach may vary from term to term.

IIS 1111 Engineering Software **1 QH**

Demonstrates the use of a programming language (Pascal) and Turbo Toolbox in solving mathematical problems, as well as the use of commercially available software for solving engineering problems. Provides practical examples of engineering applications, and lab assignments further illustrate the use of available software.

IIS 1200 Work Design **4 QH**

Topics include the engineering design process, principles of work physiology, and workplace design from the standpoint of employee safety and effectiveness. Covers work measurement techniques, including direct measurement, synthetic standards, and work sampling. Includes a project in which principles of work design must be applied.

IIS 1300 Probabilistic Analysis for Engineers 4 QH

Presents probability theory axiomatically, with emphasis on sample space representation of continuous and discrete random variables. Covers standard distributions, expectation, transform techniques, and change of variable. *Prereq.* *Integral and differential calculus.*

IIS 1310 Statistics 4 QH

Examines the definition of a statistic; distributions of random variables, including normal, T, chi-square, F, Poisson, and binomial; estimation of parameters; point estimation by method of moments; maximum likelihood; interval estimation; hypothesis testing; and chi-squared goodness-of-fit tests. *Prereq.* *IIS 1300.*

IIS 1330 Principles of Computation and Programming I 4 QH

Reviews algorithms, computers, and programming; machine language programming (instruction, execution, and addressing techniques); coding and representation of data; program debugging and verification. Surveys machines, devices, and languages. *Prereq.* *Higher-level language.*

IIS 1340 Operations Research I 4 QH

Topics include deterministic models, including LP and duality; transportation and allocation; sensitivity and post-optimality analyses; and network analysis, including maximal flow, shortest route, and PERT. *Prereq.* *MTH 1223.*

IIS 1341 Operations Research 2 4 QH

Focuses on the stochastic models in operations research and their analytical development and solution. Topics include queuing models, deterministic and stochastic inventory models, Markov chains, and sequencing. Presents dynamic programming and recursive functional expressions. *Prereq.* *IIS 1310.*

IIS 1345 Management Information Systems 4 QH

Examines the design and implementation of computer-based information systems. Topics include the value of information; tools of system analysis and design; impact of computer-based information systems on organizations and society; rudimentary computer architecture; input devices; data organization and storage; system configuration; communications; and output/display devices.

IIS 1350 Digital Simulation Techniques 4 QH

Covers model development, validation, and experimentation for discrete event simulation models. Topics include problem formulation, data collection and analysis, random variable generation, and statistical analysis of output. Utilizes a major simulation language such as GPSS, SIMAN, or SIMSCRIPT. *Prereq.* *Higher-level language and IIS 1310.*

IIS 1360 Engineering Economy and Statistical Decisions Theory 4 QH

Familiarizes the student with the theory and techniques of economic evaluation of an investment project. Presents introductory steps in the analysis of investment proposals, time value of money, and cash flows. Analyzes deterministic and stochastic cash flows in terms of present worth, annual cost, rate of return, and benefit/cost ratio. Studies decision tree for sequential decisions, criteria for decision making under uncertainty, utility theory, value of information, effect of accounting procedures, and taxes on investment analysis. *Prereq.* *IIS 1300.*

IIS 1366 Engineering Economy 4 QH

Topics include the formulation of analytical techniques, such as, rate of return, present worth, and annual cost. Considers the application of these techniques to solve business and engineering problems involving design, selection, replacement, lease-buy decisions, and decisions among multiple alternatives. Introduces sensitivity analysis and basic probability in cases where uncertainty exists. Surveys sources and costs of capital, debt-versus-equity financing, and leverage. *Not open to Industrial Engineering majors.*

IIS 1400 Systems 4 QH

Examines modeling, analysis, and control of linear feedback systems through consideration of the following topics: differential equations as system models; transfer functions and block diagrams; system components and the method of analogies; accuracy, and stability. *Prereq.* *MTH 1230.*

IIS 1401 Design Project 4 QH

Examines analysis and design of major industrial engineering systems. Students are expected to undertake up to five projects drawn from line balancing, job shop scheduling, stochastic network analysis, reliability in design, complex queuing system design, sequencing, or other areas of student and faculty interest. *Prereq.* *IIS 1341, IIS 1350, IIS 1360, and IIS 1405.*

IIS 1405 Production and Inventory Control 4 QH

Explores basic inventory models and inventory management systems, single-stage and multi-stage systems and their dynamics, production control and aggregate planning, and mathematical and heuristic approaches to aggregate scheduling. Topics include cost structure and decision-oriented analyses, and consideration of job shop scheduling and dispatching problems. *Prereq.* *IIS 1310 and IIS 1340.*

IIS 1415 Facilities Design 4 QH

Examines the use of descriptive and optimizing models (for example, simulation, queuing theory, and linear programming) to design facilities and associated materials-handling systems. Applies computer-assisted layout analysis techniques to problems of real-world scope. *Prereq.* *IIS 1340.*

IIS 1425 Material Handling System Design 4 QH

Discusses the design and analysis of large materialhandling systems. Topics include computer control of handling systems, integration with production and inspection, automated storage/retrieval systems, automatic identification systems, and systems acquisitions. *Prereq.* IIS 1340.

IIS 1436 Quality Assurance 4 QH

Covers basic principles to state-of-the-art concepts and application of statistical process control. Applies principles to a variety of products. Topics include measuring and controlling product quality, Shewhart control charts, quality cost, pareto analysis, discrete and variable sampling, and military standards in quality control. *Prereq.* IIS 1310.

IIS 1441 Engineering Reliability/Risk Analysis 4 QH

Examines principles of reliability and risk analysis of large engineering systems, for example, chemical and electric power plants, dams, manufacturing systems, mechanical, and electrical systems. Discusses failure modes and effects analysis (FMEA tables), reliability block diagrams, success and fault trees, and Bayesian analysis methods. Other topics include the redesign of systems for improved safety, productivity, and availability. Guest lecturers will speak on various case studies from each field of engineering. *Prereq.* IIS 1300 or equiv. or permission of instructor.

IIS 1450 Expert Systems 4 QH

Introduces students to the theory, topics, and applications of expert systems in engineering. Topics include knowledge representations formats (production rules, frames, networks, and logic systems), heuristics in engineering (deterministic and nondeterministic), fuzzy logic, certainty factors, cognition, memory, decision strategies, design of expert systems, shells, current research goals, and applications in engineering. Each student must complete a term project in expert systems development and/or application. *Prereq.* GE 1100, IIS 1300, IIS 1330, or permission of instructor.

IIS 1465 Microprocessor Applications 4 QH

Analyzes system architecture of several microcomputers, including microprocessors, bus design, multichip operation, and current trends in processors (8-, 16-, and 32-bit). Discusses interfacing problems and hardware including sensors, actuators, D/A and A/D converters, data transmission, and parallel/serial I/O. Other topics include

real-time programming with case studies; network and distributed processing; and development techniques and current state of the art trends. *Prereq.* IIS 1330, assembly language, or permission of instructor.

IIS 1466 Manufacturing Automation 4 QH

Familiarizes students with the process of manufacturing and potential for automation. Studies designing for automation including required hardware and software. Involves hands-on experience with robotics programming and implementation, programmable control programming, and CNC machine programming using APT and G code. *Prereq.* IIS 1330 and IIS 1465 or permission of instructor.

IIS 1470 Human Considerations in Engineering Design 4 QH

Introduces human factors with emphasis on the physiological and anthropometric bases of equipment and workplace design. Topics include an overview of the field of human factors; work, fatigue, and endurance; thermal regulation and heat stress; biomechanics; effects of aging on work capacity; and body response to vibration.

IIS 1475 Human-Machine Systems 4 QH

Emphasizes human sensory/motor performance, information-processing capabilities, learning, and skilled-task performance. Topics include an introduction to the experiment as a source of knowledge of human performance characteristics; vision, visual performance, and principles of display design; audition, noise, hearing damage, and auditory signals; information processing; signal detection; aging effects; and system development.

IIS 1777 Honors Adjunct 1 QH

To be added to any 4 QH course in the department when approved by the Honors Committee of the College of Engineering. Once approved, the adjunct information is forwarded to the Honors Office for dissemination to the honors membership. Students may enroll in IIS 1777 an unlimited number of times as it can be an adjunct to any industrial engineering course.

IIS 1800 Independent Study in Industrial Engineering 4 QH

Independent study on advanced IE topics for students usually in the senior year and with high scholastic standing. Projects may be of an applied or theoretical nature. A formal report is submitted to student's project supervisor at the end of quarter.

Mechanical Engineering

The course descriptions listed under mechanical engineering are intended to show the general scope of the subject that will be covered. Since courses are continually updated, specific topics or methods of approach may vary from term to term.

ME 1111 Key Ideas in Engineering 1 QH
Introduces first-year students to engineering as a creative practice. Discusses the relationship between engineering and science, and between engineering and economic activity. Explores the challenge, necessity, and satisfaction of lifelong learning in an engineering career.

ME 1201 Statics 5 QH
Examines vector representation of force and moment; equivalent force systems; centroids and centers of gravity; and distributed forces. Investigates equations of equilibrium; free-body diagrams; applications to trusses, pin-connected frames, and beams; shear and moment diagrams; and elementary concepts in friction. Introduces virtual work. *Prereq.* PHY 1222.

ME 1202 Dynamics I 5 QH
Develops problem-solving ability in the fundamentals of dynamics. Topics include kinematics of particles, kinematics of rigid bodies, and mass moments of inertia. Examines kinetics of particles and rigid bodies using force, mass, and acceleration. *Prereq.* ME 1201.

ME 1203 Strength of Materials I 5 QH
Explores the concept of stress and strain; state of stress and strain at a point; and stress-strain relations and material properties. Investigates moment of inertia of areas; stress and deformation of simple members under axial and torsional loads; and stresses in symmetrical beam bending. Involves lab sessions to support the lectures. *Prereq.* ME 1201.

ME 1314 Strength of Materials 2 4 QH
Topics include asymmetrical bending; analysis of determinate and indeterminate beams by various methods; and buckling of columns. *Prereq.* ME 1203.

ME 1315 Dynamics 2 4 QH
Continues development of problem-solving ability in dynamics. Topics include kinematics of rigid bodies using rotating frames, kinetics of particles and rigid bodies using work and energy, introduction of Lagrange's equations, kinetics of particles and rigid bodies using impulse and momentum, and simple gyroscopic motion. *Prereq.* ME 1312.

ME 1320 Dynamics for Civil Engineers 4 QH
Topics include kinematics, translating reference frames, mass moments of inertia, plane motion of rigid bodies, and instantaneous equations of motion. *Prereq.* CIV 1210.

ME 1321 Mechanics for Electrical Engineers 4 QH
Focuses on the study of the mechanics of rigid bodies, instantaneous equations of motion, work and energy, and impulse and momentum. *Prereq.* PHY 1222.

ME 1335 Mechanical Design 5 QH
Covers applications to the design process of the basic concepts of mechanics, strength of materials, and mechanical behavior of materials. Discusses basic considerations in design and its open-ended nature. Reviews fundamentals of stress and deflection analysis; theories of failure; design for fatigue strength; product liability; numerical methods in design, modeling, simulation; and optimization of mechanical systems. *Prereq.* ME 1314.

ME 1336 Design Project 1 5 QH
Applies the engineering sciences to the design of a system, component, or process. Students will choose the particular design project with the approval of appropriate faculty. Design teams will be organized. Each project will include the use of open-ended problems, development and use of design methodology, formulation of design problem statements and specifications, consideration of alternative solutions, feasibility considerations, and detailed system descriptions. It should include realistic constraints (such as economic factors, safety, reliability, maintenance, aesthetics, ethics, and social impact). *Prereq.* ME 1335 and ME 1337.

ME 1337 Thermal Design 5 QH
Focuses on developing the ability of the students to synthesize their knowledge and understanding of the concepts of thermodynamics, fluid mechanics, and heat transfer to meet the specifications of various thermal design objectives through the assignment of open-ended problems. Reviews fundamentals of heat transfer and fluid mechanics, numerical methods in heat transfer, heat transfer analysis of heat exchangers, heat exchanger pressure drop analysis, modeling, system simulation, and topics in optimization. One or more design projects are assigned. Utilizes various software on mainframe and microcomputers throughout the course and in the projects. *Prereq.* ME 1365.

ME 1338 Design Project 2 5 QH
Continues the project started in ME 1336. Students remain in the same group and under the direction of the same faculty advisers as in

ME 1336. These guidelines may be waived in exceptional cases with the department chair's approval. *Prereq.* ME 1336.

ME 1340 Thermodynamics 4 QH

Thermodynamics is the study of systems in which energy and its flow across systems boundaries are important. In this course, energy, heat, and work are defined and used in the First Law of Thermodynamics. Introduces other thermodynamic properties and equations of state, with emphasis on tabular and graphical forms for simple compressible systems and on the ideal gas. Introduces the Second Law of Thermodynamics and the property entropy, and discusses their macro- and microscopic implications. Concentrates on basic concepts and their proper application to representative engineering systems. *Prereq.* MTH 1223, not open to ME or ECE power majors.

ME 1360 Thermodynamics I 5 QH

Thermodynamics is the study of systems in which energy and its flow across systems boundaries are important. Defines energy, heat, and work in the First Law of Thermodynamics. Introduces other thermodynamic properties and equations of state, with emphasis on tabular and graphical forms for simple and compressible systems on the ideal gas. Discusses phases and phase transitions, and examines energy analysis of both open and closed systems. Introduces macro- and microscopic implications of the Second Law of Thermodynamics and the property entropy, and discusses their macro- and microscopic implications. Emphasizes the macroscopic consequences of irreversibility and the limitation this places, through the Second Law, on the behavior of engineering systems. This course meets four times weekly and integrates problem-solving strategies while concentrating on basic concepts. *Take MTH 1223 concurrently.*

ME 1361 Thermodynamics 2 5 QH

Studies of vapor power systems including the Rankine cycle and its modifications for use with both fossil and nuclear fuels, vapor refrigeration systems, and all-gas cycles including the Brayton cycle and its modifications; the Otto cycle; the Diesel cycle; and supercharging and turbocharging. Introduces the concepts of availability and irreversibility and thermodynamics of nonreacting mixtures with applications to air/water/vapor mixtures for air-conditioning systems and cooling towers. Discusses the elements of optimum power plant design. *Prereq.* ME 1360.

ME 1362 Thermodynamics 3 5 QH

Continues the thermofluids sequence. Topics include thermodynamic relations using generalized charts; reacting gas mixtures and combustion; and chemical equilibrium. Introduces one-dimensional compressible flow, including isentropic flow with area change; and normal shock waves. Includes a lab. *Prereq.* ME 1361.

ME 1365 Heat Transfer 5 QH

Studies the theories that describe conduction, convection, and thermal radiation heat transfer mechanisms. Discusses steady-state and transient conduction problems in rectangular, cylindrical, and spherical coordinate systems. Studies convective heat transfer mechanisms, and introduces various correlations. Presents a description of thermal radiation heat transfer between surfaces. Includes various lab experiments. *Prereq.* ME 1360, ME 1375, and MTH 1226.

ME 1375 Fluid Mechanics 5 QH

Studies fundamental principles in fluid mechanics. Topics include hydrostatics (pressure distribution, forces on submerged surfaces, and buoyancy); Newton's law of viscosity; dimensional analysis; integral forms of the basic laws (conservation of mass, momentum, and energy); pipe flow analysis; and differential formulation of basic laws with laminar flow analyses. Includes labs and a computer project. *Prereq.* ME 1360 and MTH 1225.

ME 1380 Materials Science 5 QH

Introduces materials science for engineers, emphasizing the structure/property/function relation. Topics include crystallography, structure of solids, imperfections in crystals, phase equilibrium, phase transformations, diffusion, and physical/electrical properties. Includes a lab. *Prereq.* CHM 1132 and ME 1360.

ME 1386 Materials Science 4 QH

Introduces materials science for engineers, emphasizing the structure/property/function relation. Topics include crystallography, structure of solids, imperfections in crystals, phase equilibrium, electrical and magnetic properties of metals, semiconductors and junctions. *Prereq.* CHM 1132.

ME 1392 Measurements and Analysis 5 QH

Examines design of experiments, instrumentation, measurements, data analysis, and report writing. Applies the principles developed in class to a variety of lab experiments. Requires written reports. Topics include force, strain, rotational frequency, temperature, pressure, power, and A/D conversion techniques. Lab fee.

ME 1401 Applied Elasticity 4 QH

Topics include analysis of curved beams, rings, and thick-walled pressure vessels; introduction to plane elasticity problems using rectangular and polar coordinate systems; and concepts of stress and strength. *Prereq.* ME 1314.

ME 1408 System Analysis and Control 4 QH

Explores the theoretical background necessary to analyze and design simple linear control systems. Focuses on system modeling, linear approximations and their limitations, transfer functions, and block diagrams; transient and frequency response; and stability. Discusses frequency domain and root locus techniques. *Prereq.* ME 1315.

ME 1410 Design for Space Applications 4 QH

Studies Keplerian motion and transfer dynamics using Battin's solution. Considers optimization of transfer dynamics with respect to our solar system; and mass optimization, boost, and reentry dynamics. Utilizes integrated design throughout the course. *Prereq.* ME 1315.

ME 1415 Mechanical Vibrations 5 QH

Studies one-, two-, and multi-degrees of freedom systems using classical, energy, Laplace, matrix, and computer techniques. Includes lab demonstrating vibration measurement. *Prereq.* ME 1202.

ME 1430 Aspects of Forensic Design 4 QH

Utilizes case studies in which students assume various investigative and court room roles, including (for both plaintiff and defendant) expert witnesses, lawyers, field and office engineers, and jury discussion. Examines consumer protection accidents, the effect of changing standards and codes, classes of mechanical systems normally involved in consumer cases, the methodology of technical questioning, and writing and presenting expert reports. *Prereq.* ME 1335 and ME 1337.

ME 1435 Computer-Aided Design 4 QH

Introduces the concepts of computational and numerical geometry for design. Includes the implementation of computer graphics in design and use of computer-aided design packages. Covers principles of numerical control techniques to design and manufacture. Requires a design project. *Prereq.* GE 1100 and ME 1314.

ME 1436 Advanced Computer-Aided Design 4 QH

Covers advanced applications of interactive graphics concepts to different engineering tasks including animation; solid modeling; numerical control; mass properties; finite element modeling and analysis; and other traditional engineering analysis. Presents advanced concepts and features of interactive graphics and analysis programming languages. Includes FORTRAN interface and CAD/CAM packages to give students hands-on experience in lab settings. Requires a design project. *Prereq.* ME 1435.

ME 1470 Fluid Mechanics 2 4 QH

Topics include velocity potential and stream functions; circulation and Kelvin's theorem; two-dimensional, steady irrotational incompressible flow; and Karman-Pohlhausen method applied to two-dimensional boundary layers. *Prereq.* ME 1375.

ME 1473 Gas Dynamics 4 QH

Focuses on application of the principles of fluid mechanics to compressible flows. Discusses wave propagation and the concepts of sound speed and Mach number. Emphasizes one-dimensional steady flows including the effects of area change, friction, and heat transfer. Considers normal shock waves and the possibility of choking. *Prereq.* ME 1375.

ME 1480 Mechanical Behavior of Materials 4 QH

Studies the physical basis for the mechanical behavior of solid materials, including elasticity, plasticity, viscoelasticity, and fracture. Discusses structural alloys and polymers. *Prereq.* ME 1203 and ME 1380.

ME 1483 Materials Processing 4 QH

Surveys the essential features and materials limitation of various methods for processing materials. Topics include heat treatment (ferrous and nonferrous alloys), casting, forming, joining, and machining. *Prereq.* ME 1380.

ME 1490 Special Topics 4 QH

When offered, topics will vary depending on the interests of a group of students and/or of the department. *Permission of the department.*

ME 1496 Mechanical Engineering Project I 4 QH

Involves a project of an analytical or experimental nature. Each student must, before the end of the first week of the quarter, obtain written approval for a proposed project from the department chair and a department faculty member under whom the student will work. A formal report must be submitted to the faculty supervisor at the end of the quarter. *Prereq.* Senior status.

ME 1541 Nuclear Engineering I 4 QH

Studies nuclear physics emphasizing atomic and nuclear structure, and radioactive decay and nuclear reactions, with particular attention to fusion and fission. Examines health physics, nuclear instrumentation, and the production and uses of radioactive isotopes. Compares thermal, fast, and breeder reactor types prior to a discussion of neutron interactions and their slowing down. Develops the four-factor formula and diffusion equation as applied to one-group theory for bare and reflected thermal reactors. Discusses flux shaping as well as energy production and distribution within the core. *Prereq.* ME 1361.

ME 1542 Nuclear Engineering 2 4 QH

Focuses on development of two-group theory for thermal reactors and considers the physics and safety of fast reactors. Discusses the effect of reactivity change, either intentional or accidental, as well as changes due to temperature, fission product build-up, xenon build-up after shutdown, and fuel depletion. Explores reactor design considerations involving the interrelation of reactor physics, reactor engineering control, distribution of power, and fuel cycle management. *Prereq.* ME 1541.

ME 1545 Internal Combustion Engines 4 QH

Presents the concepts and theories of operation of internal combustion engines based upon the fundamental engineering sciences of thermodynamics, gas dynamics, heat transfer, and mechanics. Discusses the design and operating characteristics of conventional spark-ignition, compression-ignition, Wankel, and stratified

charge spark-ignition engines. Includes performance analysis using computer programs and Newhall-Starkman charts. *Prereq.* ME 1361.

ME 1580 Engineering Materials 4 QH

Discusses the utilization of materials science in the application and selection of materials. Topics include reactions with environment, such as oxidation and corrosion; materials selection criteria; and materials engineering case studies dealing with materials selection and failure analysis. *Prereq.* ME 1380.

ME 1702 Dynamics 1 (Honors) 5 QH

This course is identical to ME 1202. The honors section will meet as a separate recitation section for additional lectures and other activities related to the theory and applications of dynamics. *Prereq.* ME 1201.

ME 1703 Strength of Materials 1 (Honors) 5 QH

This course is identical to ME 1203. The honors section meets separately for lab and other activities related to the theory and applications of strength of materials. *Prereq.* ME 1201.

ME 1760 Thermodynamics 1 (Honors) 5 QH

This course is identical to ME 1360. The honors section will meet as a separate recitation section for additional lectures and other activities related to the theory and applications of thermodynamics. *Take MTH 1223 concurrently.*

ME 1765 Heat Transfer (Honors) 5 QH

This course is identical to ME 1365. The honors section meets separately for lab and other

activities related to the theory and applications of heat transfer. *Prereq.* ME 1360, ME 1375, and MTH 1226.

ME 1777 Honors Adjunct 1 QH

To be added to any 4 QH course in the department when approved by the Honors Committee of the College of Engineering. Once approved, the adjunct information is forwarded to the Honors Office for dissemination to the honors membership. Students may enroll in ME 1777 an unlimited number of times as it can be an adjunct to any mechanical engineering course.

ME 1796 Independent Study/Research 1 (Honors) 4 QH

Involves an analytical or experimental project. Open only to students who are in the Honors Program. Before the end of the first week of the quarter, each student must obtain written approval for a proposed project from a department faculty member under whom the student will work and from the College of Engineering's Honors Committee. A formal report must be submitted to the faculty supervisor at the end of the quarter. *Prereq.* Junior or senior status in the honors program.

ME 1797 Independent Study/Research 2 (Honors) 4 QH

Continues ME 1796. *Prereq.* ME 1796.

Computer Science

COM 1100 Fundamentals of Computer Science 4 QH

Studies computers and computer programming. Introduces basic concepts of a high-level language such as data types, variables, assignment, expressions, statements, and input/output. Surveys structured programming tools including flow control constructs, procedures and functions, parameters, local variables, and user-defined data structures. Discusses the string and array data structures in detail. Introduces graphics and animation. Emphasizes the systematic design of programs using structured components.

COM 1101 Algorithms and Data Structures 1 4 QH

Introduces algorithms, data structures, abstraction, and modularization. Discusses elementary sorting and searching. Studies data structures such as records and combinations of arrays and records, external text and binary files, linked lists, stacks and queues. Introduces recursion as a technique for rapidly designing complex algorithms. *Prereq.* COM 1100 or COM 1108 or equiv.

COM 1102 Symbolic Programming and Its Applications 4 QH

Introduces the fundamental concepts and applications of functional programming and their relationship to computer science. Reviews basic ideas underlying symbolic information processing and the role of LISP in this context. Covers applications selected from artificial intelligence, programming language design and implementation, procedural and data abstraction, and development of data-driven programs. *Prereq.* COM 1101.

COM 1105 Computer Science and Its Applications 4 QH

Provides an opportunity for students of all majors to understand and experience the computer science field and to become informed and intelligent users of its tools. Explores using the computer as a fundamental component of the problem solving process. Discusses the basic principles as well as relevant historical, social, cultural, and ethical issues. Provides hands-on experiences

with applications such as word processors, spreadsheets, database management systems, Hypercard, graphics-statistics packages, and simulations.

COM 1107 Introduction to Programming for Non-Computer Science Majors I 4 QH

Introduces the Pascal language and the writing of computer programs. Examines variables, assignment, screen input-output, flow control (decisions and loops). Explores program design and problem solving using procedures and functions.

COM 1108 Introduction to Programming for Non-Computer Science Majors 2 4 QH

Examines simple data structures (arrays and strings), user-defined data structures, records, combinations of arrays and records, text file input/output, and simple graphics. Introduces recursion. Emphasizes examples that focus on problem solving and applying programming to other disciplines. *Prereq.* COM 1107.

COM 1110 FORTRAN Laboratory 1 QH

Considers elements of FORTRAN programming for those familiar with a high-level language such as Pascal or C. Includes input/output, subroutine linkage, and methods of structured programming in FORTRAN. *Prereq.* COM 1100.

COM 1114 C Laboratory 1 QH

Examines elements of C programming for those familiar with a high-level language such as Pascal and with elementary data structures. Emphasizes how C combines tools for structured programming with mechanisms for producing efficient code. Introduces UNIX. *Prereq.* COM 1101.

COM 1121 Computer Science Overview 1 1 QH

COM 1122 Computer Science Overview 2 1 QH

Reviews and gives practice to the intellectual skills needed for success as a computer science major. Discusses issues that can affect academic success and introduces the intellectual and cultural opportunities at Northeastern University and in Boston. Includes readings about major figures in computing and guest lectures that survey advanced fields in computer science. Looks ahead to professional work in computer science. *Prereq.* Computer science major.

COM 1130 Computer Organization and Programming 1 4 QH

Introduces computer organization and programming at the assembly-language level. Topics include arithmetic instructions, memory organization and data representation, addressing modes, flow control instructions, subroutines, procedures and linkage with higher-level languages, run-time stack structure, implementation of recursion, floating point and bit instructions, terminal I/O using system services or higher-level languages, and use of the debugger. *Prereq.* COM 1101.

COM 1131 Computer Organization and Programming 2 4 QH

Focuses on user-defined macros, character string instructions, decimal instructions and conversion, queue instructions, exception handlers, digital circuits, gate minimization, and combinational systems. *Prereq.* COM 1130.

COM 1201 Algorithms and Data Structures 2 4 QH

Introduces complex data structures and the corresponding algorithms for manipulation. Examines trees; binary search; priority queues, heaps, and heapsort; and quicksort. Introduces analysis of algorithms. Surveys graphs; depth-first and breadth-first search; shortest path and minimal spanning tree; sets, union, and find; hashing; and balanced trees. *Prereq.* COM 1101 and MTH 1137.

COM 1205 Software Design and Development 4 QH

Presents the latest ideas and techniques in software methodology and provides a means for students to apply these techniques. Students, working in groups, will be expected to design, implement, test, and document a large software project. *Prereq.* COM 1201.

COM 1310 File Structures 4 QH

Focuses on analyzing file structure organizations in terms of seek time, rotational latency, and data transfer time for magnetic disk drives. Studies external sorting, B-trees, and hashing algorithms. Introduces applying simple mathematical methods to the performance analysis of various file structures. *Prereq.* COM 1201.

COM 1315 Database Design 4 QH

Focuses on designing a database for use in a relational database management system. Uses the entity-relationship model and normalization on example problems. Presents the SQL language. Topics may include the network model, the hierarchical model, or the object-oriented model. Nonmajors with programming experience in Pascal or C are welcome. Requires implementing a database schema and short application program on a commercial database management system. *Prereq.* COM 1101 or programming experience in a high-level language.

COM 1316 Database Management 2 4 QH

Focuses on database systems that support relational model applications. Topics include recovery, query optimization, integrity, and security and concurrency, with examples based on INGRES and System R. Covers additional topics such as database machines at the discretion of the instructor. Implements a small relational DBMS. *Prereq.* COM 1315.

COM 1317 Transaction Processing Systems 4 QH

Focuses on the concepts and practice of modern transaction processing systems in a distributed setting. Describes the overall architecture of systems such as TP monitor, recovery manager,

log manager, and lock manager. Discusses the principles of DO/UNDO/REDO logging such as the write-ahead log rule and the force log-on-commit rule. Describes compensation log records, checkpoint and restart recovery procedures, two-phase commit, lock tables, granularity of locking, and two-phase locking. *Prereq.* COM 1310 and COM 1315.

COM 1330 Operating Systems Concepts 4 QH

Introduces basic structure, components, design, implementation, and internal operation of the kernel of computer operating systems. Surveys operating system history, input/output device management, process environment, CPU scheduling, concurrent processes and synchronization, interprocess communication mechanisms, memory management, and device drivers. Uses examples from many operating systems (MS-DOS, UNIX) to reinforce concepts. Includes a lab to expose students to the system concepts through programming exercises. *Prereq.* COM 1140 and COM 1130 or equiv.

COM 1335 Operating Systems 1 4 QH

Continues COM 1330. Discusses components needed to create commercial operating systems. Covers security and access control, resource allocation, deadlock management and resolution, file system structures, and distributed operating systems. Offers examples from many operating systems (UNIX, VMS) to reinforce concepts. Requires programming and modifying operating system components through labs. *Prereq.* COM 1330.

COM 1336 Operating Systems 2 4 QH

Explores advanced topics in operating system design. Allows students to complete the study of device management begun in COM 1335 and implement a device driver for a small operating system. Covers topics in theoretical aspects of operating system design such as mechanisms for high- and low-level synchronization, deadlock, distributed algorithms, management of paged memory, queueing theory, and computer security. *Prereq.* COM 1335 and MTH 1387.

COM 1337 Computer Communication Networks 4 QH

Explores data networking. Focuses on concepts, technology, and implementation issues. Discusses distributed system requirements, network architectures, OSI model, communication protocols, routing algorithms, local area networks, public data networks, vendor network architecture, PC networks, standards, internetworking, network management, and performance issues. Uses examples from real networks (such as IBM SNA, DECnet, Ethernet, Token Ring, and X.25) to reinforce theory. Requires using real networks and designing and implementing communication protocols. *Prereq.* COM 1330.

COM 1350 Automata and Formal Languages 4 QH

Topics include finite-state machines and regular expressions; context-free grammars; properties and decidability problems of regular and context-free languages; pushdown automata; pumping theorems for regular and context-free languages; and Turing machines, Church's thesis, and the halting problem. *Prereq.* COM 1201 and MTH 1137.

COM 1355 Compiler Design 1 4 QH

Implements concepts such as finite state automata, regular expression pattern matching, and context-free grammars using a lexical analyzer and a compiler-compiler. Emphasizes LALR(1) or LL(1) parsing with exposure to top-down, bottom-up, and operatorprecedence methods. Examines ambiguous grammars and may include some code generation. Uses a "hands-on" approach, including either a sequence of programming assignments or a project. *Prereq.* COM 1131 and COM 1350.

COM 1356 Compiler Design 2 4 QH

Discusses advanced topics related to code generation: run-time environment, symbol table organization, and scope rules. Other topics include type checking, aggregate types (arrays and records), error analysis and recovery, code optimization, tail recursion, functional programming, and polymorphic functions. Implements theoretical ideas through programs or a large project. *Prereq.* COM 1355.

COM 1358 Analysis of Programming Languages 4 QH

Topics include run-time behavior of programming languages; interpreters; static and dynamic scoping; parameter-passing mechanism; implementation of functions and recursion; and features of current languages and their implementation. *Prereq.* COM 1102.

COM 1370 Computer Graphics 4 QH

Focuses on characteristics and programming of graphics output devices. Presents basics point and line drawing, two-dimensional displays, and clipping and windowing. Surveys pictures: data structures and display file organization; and interaction: graphical input and external events-operating system considerations. Includes some three-dimensional drawing. *Prereq.* COM 1201 and MTH 1301.

COM 1390 Analysis of Algorithms 4 QH

Introduces the basic principles and techniques of analyzing algorithms. Topics include algorithms on sorting, searching, graphs, and digraphs (such as minimal spanning tree, shortest path, depth-first search, components of a graph); and methods involving string matching, polynomials and matrices. Considers fast Fourier transform and the concept of NP-complete problems. *Prereq.* COM 1201, MTH 1125, MTH 1137, and MTH 1301.

COM 1410 Artificial Intelligence 4 QH

Focuses on analysis of current computer algorithms dealing with problems such as theorem proving, chess playing, general problem solvers, robotics, symbolic computation, perceptions, and self-reproducing automated parallel machines. *Prereq.* COM 1102, COM 1201, and MTH 1409.

COM 1420 Principles and Methods in Interactive Systems Design 4 QH

Introduces principles of computer-human interface (software) design, and methodologies of implementation, evaluation, and research in computer-human interaction. Topics include user psychology, dialog styles (menu interfaces, command languages, icons, windows), screen layout and design, input and output devices (mouse, touchscreen, keyboard, voice technology), error handling/reporting and system response time, user documentation, and "intelligent" interfaces. Traces techniques for implementing software-human interfaces, and methodologies for testing and assessing the "usability" of interactive systems.

COM 1600 Computer Science Project 4 QH

Presents the latest ideas and techniques in software methodology and provides a means for students to apply these techniques. Students, working in groups, will be expected to design, implement, test, and document a large software project. *Prereq.* COM 1102, COM 1110, COM 1201, and COM 1355.

COM 1621 Computer Science Seminar 1 QH

A capstone course for computer science majors. Meetings are held once or twice per week and a current topic or problem in computer science is presented by an expert in the subject matter. Students are assigned additional questions and/or problems to research in the topic area as an aid to developing a deeper appreciation and understanding of various aspects of computer science. *Prereq.* Computer science seniors only.

COM 1700, COM 1701, COM 1702, COM 1720, COM 1730, and COM 1731 4 QH each

Offers a special section for honors students in COM 1100, COM 1101, COM 1102, COM 1201,

COM 1130, and COM 1131 respectively. *Prereq.* Enrollment in the Honors Program or permission of the instructor.

COM 1705, COM 1717, COM 1737, and COM 1757 5 QH each

Offers a special section for honors students in COM 1205, COM 1316, COM 1335, and COM 1350 respectively. *Prereq.* Enrollment in the Honors Program or permission of the instructor.

COM 1770 Honors Computer Science Seminar 4 QH

Offers a capstone course for computer science honors students. Exposes students to a variety of computer science topics of current interest, and provides an opportunity to improve skills in presenting technical material. Requires students to prepare a one hour presentation of professional quality on a topic of interest in computer science. Requires the student to write a paper on the same topic.

COM 1777 Honors Adjunct Computer Science 1 QH

Allows honors students who do not have an honors section to do honors work in one of the computer science elective courses while enrolled in the regular course.

COM 1800 Directed Study in Computer Science 4 QH

Programs of directed study, held one or more quarters, are available for highly motivated students who wish to explore in depth special topics in computer science. Directed study can be used as an opportunity to examine familiar material in fresh ways or to explore new material that is not offered in formal courses. Provides students strong in computer science and related sciences a chance to develop the art and skill needed to work independently and creatively in computer science. *Prereq.* Permission of the instructor; may be repeated for credit.

COM 1810 Topics in Computer Science 4 QH

Focuses on an advanced topic in computer science to be selected by the instructor. *Prereq.* Permission of the instructor.

Engineering Technology

Computer Technology

CT 1105 Introduction to Programming 4 QH

Introduces C language as a problem-solving tool. Topics include control statements, arrays, functions, and pointers. Utilizes the University's computer facilities to run program assignments.

CT 1150 Computer Organization 4 QH

Presents basic computer architecture. Topics include number systems' operation and conver-

sion, logic circuits, registers, data busses, ROM/RAM, microcomputer structure and operation, microprocessor internal components, microprocessor programming, and input/output processing. *Prereq.* CT 1105.

CT 1310 FORTRAN 4 QH

Presents FORTRAN 77 as a second language with emphasis on structured programming and

modularity. Topics include lists, matrices, subroutines, functions, global values, formatting variable, generating random number, sorting, searching, manipulating character-data, file handling, and documenting. *Prereq.* CT 1105.

CT 1311 Programming with C Language 4 QH

Teaches C, a general purpose language suitable for programming operating systems, text-processing, and databases. Covers data types, arithmetic expressions, program looping, decision making, arrays, functions, procedures, character strings, global and local variables, scope rules, pointers, address arithmetic, structures, unions, and the C input/output library. *Prereq.* CT 1310 and knowledge of a higher level language.

CT 1330 Data Structures 4 QH

Introduces methods of representing and manipulating data in computer memory. Topics include stacks, queues, lists, trees, heaps, sets, graphs, searching, and sorting. *Prereq.* CT 1311.

CT 1335 Numerical Algorithms 4 QH

Studies computer methods for solving mathematical problems. Involves writing and running application programs using Northeastern's computer. Topics include deterministic versus stochastic methods, random-number generators, iterative versus noniterative solutions, maxima and minima in two and three variables, curve fitting in two and three variables, integrals, trapezoidal and Simpson's rules, slopes, difference equations in two and three variables, vector and matrix algebra, simultaneous linear equations, nonlinear equations, permutations, and combinations. *Prereq.* CT 1105.

CT 1340 Software Engineering Design 4 QH

Offers structured methods for developing complex computer software. Provides students the opportunity to develop structured specifications, structured designs, and computer programs for complex problems and to test those programs using the University's computers. Topics include partitioning, hierarchical organization, data flow diagrams, data dictionaries, structured English, decision trees, decision tables, structured charts, team design, structured programs, and maintainability. *Prereq.* CT 1311 or CT 4311.

CT 1345 Assembly Language 4 QH

Studies a typical microprocessor assembly language. Includes writing and running homework problems on a 68,000 microprocessor-based system. Topics include CPU architecture, instruction sets, addressing modes, binary operations, code conversion, subroutines, macros, and input/output. *Prereq.* CT 1105 and CT 1150.

CT 1348 LISP 4 QH

Introduces an interactive language in which the LISP interpreter is commonly referred to as the read-evaluate-print loop. Discusses LISP's various

levels of implementation in detail. Explores LISP as an excellent medium for implementing standard techniques in data-structure manipulation, techniques for recursion, complex data structures, storage management, and symbol-table manipulation. *Prereq.* CT 1330 or CT 4330.

CT 1351 Advanced Computer Organization 4 QH

Examines the functional characteristics of complex and special-purpose computer systems, the functions of a general-purpose multiuser, and a multiprocessing operating system. Advanced topics include virtual memory and virtual machine architectures, distributed and multiprocessor systems, array processors, and system performance analysis. *Prereq.* CT 1356 and CT 1375 or CT 4356 and CT 4375.

CT 1355 Microprocessor Peripheral Hardware 4 QH

Considers the elements of microprocessor peripheral hardware and its interfacing. Covers designing and analyzing microprocessor systems, including detailed schematics, timing diagrams, and technical documentation. Topics include serial input/output devices, DMA and interrupt control devices, standard buses, bus arbitration techniques, and bus support VLSI. *Prereq.* CT 1374 or CT 4374.

CT 1356 Complex Peripheral Hardware 4 QH

Surveys the interfacing and implementation of complex peripheral systems including disc and tape interfaces, graphic display devices, communication interfaces and subsystems, and input/output processors. *Prereq.* CT 1355 or CT 4355.

CT 1360 Industry Software 4 QH

Surveys current commercial software packages and methods. Utilizes commercial packages implemented on Northeastern's computer where applicable. Topics include specific packages and methods including database management, scientific and statistical analysis, security and privacy, software assurance, and documentation. *Prereq.* CT 1330 and CT 1340 or CT 4330 and CT 4340.

CT 1363 Concurrent Programming 4 QH

Examines the principles of concurrent programming. Involves writing and running programs to demonstrate aspects of concurrent programming techniques and issues. Explores correctness of concurrent programs, material exclusion, the timing of Dekker's algorithms, the producer-consumer problem, monitors, semaphores, "Ada Rendezvous," critical regions, and conditional variables. *Prereq.* CT 1330 and CT 1340 or CT 4330 and CT 4340.

CT 1365 Industry Hardware 4 QH

Discusses the latest industrial developments and trends in computer hardware. Conducted as a seminar. *Prereq.* CT 1356.

CT 1368 Semiconductor Logic 4 QH

Analyzes the bipolar and MOS transistors in saturated and cutoff condition and implements these concepts to form basic logic and decision-making circuits. Demonstrates converting logical expressions into hardware configuration representations. Focuses on Ebers-Moll modeling, PMOS, NMOS, CMOS construction, and logic families. *Prereq. EET 1311 or EET 4311.*

CT 1369 Computer Logic 4 QH

Introduces the hardware building block of digital computers. Presents configurations of gates and memory components to achieve combinational and sequential composite logical functions. Discusses finite state machine design and analysis, gates, flip-flops, registers, decoders, ALUs, memory arrays, and synchronous and asynchronous state machines. *Prereq. CT 1368 or CT 4368.*

CT 1374 Introduction to CPU Hardware 4 QH

Introduces the circuits and operation of a microcomputer. Studies the microprocessor and its basic support components and circuits, including detailed timing and functional analysis of their interactions. Topics include central processing unit, memory, addressing, clocking, bus concepts, interrupts, coprocessors, input/output, and instruction timing. *Prereq. CT 1345 or CT 4345 and CT 1368 or CT 4368.*

CT 1375 CPU Architecture 4 QH

Reviews high performance microprocessor architecture and hardware interfacing techniques. Analyzes current commercial processors and their support components. Focuses on internal CPU architecture, memory management, instruction prefetch, privilege states, bus cycles, control lines, input/output, interrupts, exceptions, and pipelining. *Prereq. CT 1374.*

CT 1377 VLSI Design 4 QH

Examines very large scale integration (VLSI) integrated circuits (ICs), the key components of all modern computers. Introduces MOS devices, circuits, design methods, and fabrication techniques used in producing custom VLSI ICs. Topics include MOS transistor characteristics, basic gate circuits, scaling, manual and automated layout tools, wafer-fabrication techniques, standards, testing, and costs. *Prereq. CT 1369 or CT 4369.*

CT 1379 Computer Networks 4 QH

Introduces the functional and operational aspects of computer networks. Topics include the ISO Reference Model's seven layers, ARPANET, DECnet, and SNA. *Prereq. CT 1380 or CT 4380.*

CT 1380 Data Communication Methods 4 QH

Introduces the ISO open systems interconnect model for communication system, and functional and operational aspects of data communication devices and software. Utilizes a black box approach. Examines modems, control units,

multiplexers, concentrators, front end processors, and error checking. *Prereq. CT 1375 or CT 4375.*

CT 1381 Operating Systems 4 QH

Surveys the basic principles and organization of operating system implementation. Explores processor management; process multiplexing and synchronization; schedules; atomic operations and mutual exclusion; sequential and concurrent programming; memory; and device and data management. *Prereq. CT 1150 and CT 1311 or CT 4350 and CT 4311.*

CT 1382 Computer Graphics Programming 4 QH

Explores the computer plotting of two- and three-dimensional shapes. Involves writing and running programs using the University's computer and digital plotter. Considers 2D transforms; 3D to 2D transforms; surface representation; shaping; hidden line; raster technology-color; introduction to interactive graphics and characters; curve fitting; and graphic data structures. *Prereq. GET 1100.*

CT 1383 Databases 4 QH

Examines database organization structure and management. Utilizes the University's computer to write and run programs exemplifying techniques developed in class. Covers access methods, attributes, indices, keys, querying, searching and matching, file sets, inverted file sets, normal forms, and random access. *Prereq. CT 1330 or CT 4330.*

CT 1384 Large System Assembly Languages 4 QH

Utilizes VAX-11 assembly language macro to show how basic components in the CPU are used during program execution. Emphasizes integer, real, and character instruction sets; various address techniques; procedure linkage; and main and system input/output. Utilizes the University's computer facilities to run program assignments. *Prereq. CT 1345 or CT 4345.*

CT 1385 Introduction to Simulation Programming 4 QH

Focuses on computer methods for solving simulated phenomena. Involves writing and running programs implementing simulations specified by instructor. Explores simple queues; multiserver queues; priorities, including first in first out, last in last out, and time aging of data; simple frequency distributions; use of SIMULA, GPSS, and standard Subroutine Library Routines. *Prereq. CT 1335.*

CT 1387 Bit-Slice Microcomputers 4 QH

The epitome of hardware flexibility is represented by the bit-slice CPU. Demonstrates the basic design ground rules common to this style of hardware design. *Prereq. CT 1355 or CT 4355.*

CT 1389 Single-Chip Microprocessors 4 QH

When small 8-bit intelligent devices are rewired in high volume, the single-chip microprocessor in the form of the 3870, 8084 Z8, and others comes into

play. An understanding of the hardware limitations of a single-chip system presents the basis for this subject material. *Prereq.* CT 1374 or CT 4374.

CT 1390 Special Problems in Computer Technology 4 QH
Theoretical or experimental work under individual faculty supervision.

CT 1395 Computer Security 4 QH
Focuses on issues related to security in computing, including the history of security, encryption techniques and applications, secure communications, and software protection. Covers software verification and validation, security design in hardware, and products currently available for recurring systems and data. Discusses privacy as well as reliability. *Prereq.* CT 1380 or CT 4380.

CT 1396 PROLOG: An Introduction to Artificial Intelligence 4 QH
Introduces fundamental artificial intelligence (AI) terms and techniques using PROLOG as a programming language. Topics include knowledge representation, search, parsing, logic, and inference techniques. Uses student projects as an integral part of the course. *Prereq.* CT 1330 or CT 4330.

CT 1480 Local Area Networks I 4 QH
Introduces local area network (LAN) concepts, architectures, application, protocols, and components. Focuses on first three layers of the ISO reference model: physical, data line, and network layers. Examines Ethernet, SNA, Token Bus, Token Ring, and other IEEE standards. *Prereq.* CT 1380 or CT 4380. *Not open to students who have taken CT 1379 or CT 4379.*

Electrical Engineering Technology

EET 1151 Circuit Analysis I 4 QH
Examines Ohm's law, Kirchhoff's current and voltage laws, equivalent resistances, independent and dependent sources, mesh and nodal analysis, and power relations, all concentrating on direct current circuits. Other topics include Thevenin and Norton theorems, the operational amplifier, and energy storage elements such as capacitors and inductors. *Prereq.* MTH 1193 or PHY 1193.

EET 1152 Circuit Analysis 2 4 QH
Studies time domain (transient) analysis of R, L, and C elements; energy storage in L and C circuits; and responses in source-free RL and RC circuits. Includes application of the unit step function and response of RLC circuits. Introduces frequency domain methods to solve sinusoidal steady-state circuits using complex frequency concepts and phasor algebra; three-phase circuits; and three-wire, single-phase systems. *Prereq.* EET 1151.

EET 1310 Electrical Measurements 4 QH
Covers standards of measurements, dimensional analysis, errors and measurement of dispersed

data, discrete and continuous variables, binomial distribution, and normal distribution. Topics include guaranteed error, methods of resistance measurements, digital voltmeters and analog-to-digital conversion, voltage references, and potentiometers and AC bridges. *Prereq.* EET 1353.

EET 1311 Electronics I 4 QH
Introduces students to solid-state electronic devices such as diodes and transistors, emphasizing specifications, circuit characteristics, and techniques for analyzing circuit behavior. Investigates diodes application in rectification, power supply regulation, clipping, clamping, and voltage doubling situations. Includes analysis and design of transistor circuit topologies and bias networks. *Prereq.* EET 1152.

EET 1312 Electronics 2 4 QH
Investigates transistor bias stabilization of discrete and integrated circuits. Examines signal models of diodes and BJT, JFET, and MOSFET transistors. Analyzes single transistor amplifier configurations and multistage amplifiers. Investigates frequency response, amplitude, and phase characteristics of transistor circuits by using techniques such as the Bode plots. Presents design methods of coupling signals among amplifier states. *Prereq.* EET 1311.

EET 1313 Electronics 3 4 QH
Focuses on feedback and its application to operational amplifier circuits for signal processing and generation. Topics include stabilizing gain and bias, improving bandwidth, reducing distortion, and impedance variation. Involves analysis and design of inverting and noninverting configurations of operational amplifier circuits, including rectifiers, oscillators, and filters. *Prereq.* EET 1312.

EET 1314 Pulse and Digital I 4 QH
Studies switching characteristics of semiconductor devices; logic gates and the logic families ECL, MOS, and Schottky TTL; speed limitations; and concepts of wave-shaping and wave-generating circuits including comparators, Schmitt trigger, and relaxation oscillators. *Prereq.* EET 1311.

EET 1315 Pulse and Digital 2 4 QH
Examines digital operations, logic statements and theorems, minimization of logic functions, logic gates and the characteristics of the integrated logic families, flip-flops, counters, and registers. Introduces sequential circuit design, sample and hold circuits, and analog-to-digital conversion. *Prereq.* EET 1314.

EET 1317 Principles of Communication Systems I 4 QH
Focuses on signal analysis using Fourier methods, noise in communication systems, frequency selective amplifiers, including wideband, transistor power amplifiers AF and RF, oscillators, and signal sources and applications. *Prereq.* EET 1313.

EET 1318 Principles of Communication Systems 2 4 QH

Explores basic theory of amplitude, frequency, phase and pulse code modulated systems, analysis of modulating and demodulating circuits. Topics include carrier systems using SSB, system block and level diagrams, logic control circuits in communication systems, and modems. *Prereq.* EET 1317.

EET 1319 Principles of Communication Systems 3 4 QH

Emphasizes the fundamentals of digital communications, sampling requirements, analog-to-digital conversion methods, and system capacity and bandwidth. Topics include comparison of practical digital systems PAM, PCM, PFM, PWM, time and frequency division multiplexing, data decoding, and selected examples from telemetry and computer links. *Prereq.* EET 1318.

EET 1320 Electricity and Electronics 1 4 QH

Introduces circuit analysis, resistive networks, periodic excitation function, steady-state AC circuits, the physical foundations of electronics, and the physical operation of electronic devices. *Prereq.* MTH 1193 and PHY 1193. Not open to electrical engineering technology majors.

EET 1321 Electricity and Electronics 2 4 QH

Examines single-stage electronic circuits, magnetic circuits and transformers, electro-mechanical energy conversion, DC machines, and AC machines. *Prereq.* EET 1320.

EET 1323 Electronic Laboratory 2 2 QH

Offers experiments with nonlinear semiconductors. Explores junction and zener diodes. Studies typical applications in clippers, clammers, rectification, filtering, electronic power supplies, voltage regulation, and integrated circuit regulators. Discusses bipolar and field effect transistors, amplifiers and voltage follower configurations, special semiconductors, and operational amplifiers. *Prereq.* EET 1311.

EET 1324 Circuits Laboratory 1 2 QH

Offers experiments in DC electrical circuits and measurement techniques. Includes use of ammeters, ohmmeters, voltmeters, VOMs, and power supplies. Studies equivalent resistance, series and parallel circuits, Ohm's law, Thevenin and Norton theorems, and superposition and maximum power transfer theorems. *Prereq.* EET 1151.

EET 1325 Circuits Laboratory 2 2 QH

Offers further experiments in electrical circuits and measurement techniques. Includes operation of oscilloscopes, audio frequency, and function generators. Explores inductance and capacitance, and the effect of frequency upon them. Studies amplitude, frequency, and phase shift measurements using a variety of series/parallel RL, RC, and RLC circuitry. Examines circuit time constants and their relation to repetition rate,

along with resonance, circuit quality, and filter circuits. *Prereq.* EET 1124.

EET 1327 Advanced Electronics Laboratory 1 2 QH

Offers experiments using oscilloscopes, the examination of transistor audio amplifiers, push-pull amplifiers, drivers, pulse and video amplifiers. Topics include transients and wave-shaping circuits, audio frequency oscillators, and the study of operational amplifiers. *Prereq.* EET 1323.

EET 1328 Advanced Electronics Laboratory 2 2 QH

Experiments with the modulation of a class C amplifier, the diode detector, basic timing circuits, RF and crystal oscillators, astable multivibrators, logic gates, flip-flops, binary adders, registers and counters. Topics include active filters, frequency modulation detectors, and analog-to-digital and digital-to-analog conversion. *Prereq.* EET 1327.

EET 1329 Advanced Electronics Laboratory 3 2 QH

Studies FM and PM waves, amplitude limiters, the balanced modulators and single sideband generators. Discusses integrated circuit timers and monolithic random access memory, and monolithic phaselocked loop, as well as a series of microwave experiments and digital experiments. *Prereq.* EET 1328.

EET 1330 Energy Conversion 4 QH

Investigates generalized theory of rotating energy conversion devices, steady-state operation of the multiply-excited direct-current machine, control of speed, special machines, transformers, steady-state considerations of induction and synchronous machines. Explores the generalized machine and circuit model, and Laplace transform techniques applied to the analysis of dynamic operating modes of rotating machines. *Prereq.* EET 1152 and MTH 1195.

EET 1337 Distributed Systems 4 QH

Examines radiation, transmission, and reception of electromagnetic waves, distributed-line constants and traveling waves of transmission lines, and differential equations of the uniform line. *Prereq.* MTH 1195 and PHY 1193.

EET 1353 Circuits Analysis 3 4 QH

Applications of differential equations to the solutions of linear, and time-invariant electrical networks. Introduces to singularity functions, convolution, and time-domain transient analysis, network topology and duality, and the methods of transformation calculus and complex frequency concepts. *Prereq.* EET 1152.

EET 1354 Circuits Analysis 4 4 QH

Focuses on signal analysis in the frequency domain, Fourier series, Fourier and Laplace transform methods, and a varied selection of circuit problems using Laplace transforms and related theorems. *Prereq.* EET 1353.

EET 1360 Engineering Analysis 1 4 QH

Studies linear algebra and circuit equation applications, as well as solution of linear differential equations, including an introduction to Laplace transforms. *Prereq.* EET 1152 and MTH 1195.

EET 1362 Basic Power Systems 1 4 QH

Focuses on power transmission lines, line constants, current voltage and power relations, electric-power distribution loads, feeders, and substations, and application of matrices. *Prereq.* EET 1354.

EET 1363 Basic Power Systems 2 4 QH

Investigates symmetrical and asymmetrical faults, protective devices—application and coordination, power flow in electric circuits, steady-state power limitations of systems, and voltage regulation theory and application. *Prereq.* EET 1362.

EET 1364 Basic Power Systems 3 4 QH

Offers computer applications to power systems with emphasis on load-flow studies, basic ideas of systems planning, short-circuit studies, and system stability. *Prereq.* EET 1363.

EET 1370 Digital Computers 1 4 QH

Introduces digital computer design. Topics include general computer organization, number systems and number representations, design characteristics of major computer units, and Boolean algebra applications to computer design. *Prereq.* EET 1311.

EET 1371 Digital Computers 2 4 QH

Examines microprocessor architecture and organization. Studies the machine language and assembly coding of an industry-accepted microprocessor, and a suitable topic from the current literature. Assembly language coding problems assigned. *Prereq.* EET 1370.

EET 1377 Control Engineering 1 4 QH

Analyzes linear servomechanisms under both transient and steady-state conditions, signal flow graphs, and Laplace transforms in the formulation of block diagrams and transfer function. *Prereq.* EET 1354 and MTH 1195.

EET 1378 Control Engineering 2 4 QH

Focuses on system stability, root locus techniques, and treatment of Nyquist criteria and Bode diagram methods for systems evaluation. *Prereq.* EET 1377.

EET 1390 Optical Instrumentation 4 QH

Focuses on telescopes, microscopes, and similar equipment, as optical system components. Includes magnification, aberrations, resolution criteria, photometry, compatibility of system components and optimization of systems, and the basic nonimage-forming systems used for analysis control and metrology. *Prereq.* MTH 1192 and PHY 1193.

EET 1399 Special Problems in Electrical Engineering Technology 4 QH

Offers theoretical or experimental work under individual faculty supervision. *Prereq.* Consent of department chair.

General Engineering Technology**GET 1100 Computer Programming for Engineering Technology 4 QH**

Introduces computers for problem solving using C language. Topics include arrays, functions, and character manipulations. Students use the University's computer facilities to run programs. *Prereq.* MTH 1191 or MTH 4107 or taken concurrently.

GET 1170 Engineering Graphics 1 4 QH

Introduces manual and computer engineering drawing using geometric constructions, charts, and graphs. Geometric construction includes descriptive geometry, orthographic projection, sections, and isometric drawing.

GET 1171 Engineering Graphics 2 4 QH

Studies computer and manual drawing in layout and assembly graphics. Topics include manufacturing processes, fasteners, gears, welding, electric/electronic drawing, architectural/structural drawing, piping, and topography. Design project required. *Prereq.* GET 1170 or equiv.

GET 1356 Engineering Economy 4 QH

Presents fundamental accounting concepts and terminology, including assets, liability, net worth, and analyzing income statements and balance sheets. Discusses introductory steps in analyzing investment proposals, time value of money, and cash flows. Analyzes cash flows in terms of present worth, annual worth, rate of return, and benefit/cost ratio. Considers depreciation and tax effects on cash flows. *Prereq.* MTH 1191.

GET 1364 Kinematics 4 QH

Studies four-bar linkages, sliders, and others, using orthogonal components of vectors, instantaneous centers, equivalent linkages, and effective cranks. Emphasizes graphic solutions and introduces the computer as a tool to enhance these concepts. Analyzes reverted and epicyclic gear trains and cam displacement. *Prereq.* GET 1171 and PHY 1191.

Mechanical Engineering Technology**MET 1301 Mechanics A 4 QH**

Explores forces, moments, couples, statics of particles, and rigid bodies in two- and three-dimensions. Examines external and internal distributed forces, first moments and centroids, and structures such as trusses, frames, and machines. *Prereq.* MTH 1193; or MTH 4120; PHY 1191 or PHY 4117.

MET 1302 Mechanics B 4 QH

Emphasizes friction, second moments, virtual work, kinematics of particles, rectilinear and curvilinear motion of dynamic particles. Topics include force, mass and acceleration, and work and energy. *Prereq.* MET 1301 or MET 4301.

MET 1303 Mechanics C 4 QH

Studies impulse and momentum of particles. Topics include kinematics and dynamics of rigid bodies: force, mass, and acceleration; dynamics of rigid bodies: work and energy, and impulse and momentum; and introduction to mechanical vibration. *Prereq.* MET 1302 or MET 4302.

MET 1314 Stress Analysis A 4 QH

Investigates axially loaded members, stress and strain, allowable stresses, factor of safety, temperature effects, indeterminate members and thin-walled pressure vessels. Topics include centric loading of bolted and welded connection, shear and moment in beams, eccentrically loaded connections, and flexural and transverse shearing stresses in beams. *Prereq.* MET 1301 or MET 4301.

MET 1315 Stress Analysis B 4 QH

Discusses determinate and indeterminate beam deflections and reactions by numerical and graphical integration and area moment methods, theorem of three moments and torsional stresses and strains. Topics include power transmission, eccentric loads on struts, beams, riveted and welded joints, combined and principle stresses, Mohr's circle, and theories of failure. *Prereq.* MET 1314 or MET 4314.

MET 1319 Mechanics 4 QH

Introduces mechanics to nonmechanical majors. *Prereq.* MTH 1193 and PHY 1191.

MET 1330 Mechanical Design A 4 QH

Introduces mechanical design, the design process, design factors, creativity, optimization, human factors, and value engineering. Discusses and develops principles through simple design projects. Topics include principles of design, properties and selection of materials; stress concentrations; strength under combined stresses; theories of failure; and impact, fluctuation, and repeated loads. *Prereq.* MET 1315 or MET 4315; MET 1380 or MET 4380.

MET 1331 Mechanical Design B 4 QH

Explores stresses, deformation and design of fasteners, screws, joints, springs, and bearings, lubrication, and journal bearings. Topics include stresses and power transmission of spur, bevel, and worm gear, shaft design, and clutches and brakes. *Prereq.* MET 1330 or MET 4330.

MET 1340 Thermodynamics A 4 QH

Introduces general theory of heat and matter, laws of thermodynamics, energy-transformation principles, availability of energy, properties and

processes for pure substances and ideal gases. Topics include thermodynamic properties and processes of liquids and vapors, tables and charts, mixtures of fluids, and vapor cycles. *Prereq.* PHY 1192 or PHY 4118.

MET 1341 Thermodynamics B 4 QH

Discusses theory of vapor engines and analysis of actual engine types using gas and vapor compression, internal combustion engines, theory of gas and vapor flow through orifices and nozzles, and principles of gas compression. Includes analysis of vapor compression, refrigeration systems, low-temperature refrigeration cycles, and absorption refrigeration systems. *Prereq.* MET 1340 or MET 4340.

MET 1342 Refrigeration and Air-Conditioning 4 QH

Focuses on air-conditioning principles, including psychometrics and heat pumps. Examines calculation of heating and cooling loads in accordance with ASHRAE practices, principles of gas compression, analysis of vapor compression, refrigeration systems, low-temperature refrigeration cycles, and absorption refrigeration systems. *Prereq.* MET 1341 or MET 4341.

MET 1343 Heat Transfer 4 QH

Presents the principles of heat transfer: thermal conductivity and thermal conductance/resistance. Examines heat transfer mechanisms, equations of conduction, and natural and forced convection. Studies hydrodynamic and thermal boundary layers, black body radiation, and Kirchhoff's law. Covers emissivity and absorptivity, radiation between simple bodies, heat transfer coefficients, heat changer effectiveness, and regenerative and evaporative heat exchangers. *Prereq.* MET 1341.

MET 1370 Fluid Mechanics A 4 QH

Investigates hydrostatics, principles governing fluids at rest, pressure measurement, hydrostatic forces on submerged areas and objects, and simple dams. Topics include fluids in moving vessels, hoop tension fluid flow in pipes under pressure, fluid energy, power, and friction loss, Bernoulli's theorem, and flow measurement. *Prereq.* MET 1302 or MET 4302.

MET 1371 Fluid Mechanics B 4 QH

Explores pipe networks and reservoir systems, flow in open channels, uniform flow, energy, friction loss, minor losses, and velocity distribution. Topics include alternate stages of flow, critical flow, nonuniform flow, accelerated and retarded flow, and hydraulic jump and waves. *Prereq.* MET 1370 or MET 4370.

MET 1380 Materials A 4 QH

Introduces fundamental metallic structures, general metallurgical information covering theoretical aspects of properties, testing, and failure of metals. Supplemented by visual aids. Topics include alloying and hardening of metals, refinement of metals, equilibrium diagrams,

characteristics of engineering metals, and principles of metal fabrication.

MET 1390 Measurement and Analysis Laboratory 2 QH

Offers experiments for the collection and analysis of data by graphics and numerical methods including computer applications, report writing that draws conclusions relative to accuracy, precision, true values, and measured values as they relate to basic mechanical measuring instruments for length, area, volume, specific gravity, pressure, temperature, and time as these parameters are utilized in making mechanical measurements. *Prereq.* GET 1100 or GET 4100; MET 1314 or MET 4314; MTH 1195 or MTH 4122; and PHY 1193 or PHY 4119.

MET 1391 Technology Laboratory A 2 QH

Presents experiments to determine mechanical properties of materials under tensile, compressive, torsional, direct shear, flexural, impact, fatigue, and creep loading conditions as they are affected by normal and abnormal environmental conditions; also as they are affected by homogeneity, nonhomogeneity, isotropy, and nonisotropy. *Prereq.* MET 1315 or MET 4315; MET 1380 or MET 4380; MET 1390 or MET 4390; or concurrently.

MET 1392 Technology Laboratory B 2 QH

Offers experiments to determine the physical properties of incompressible fluids and to measure the flow rates and velocities utilizing pilot tubes, orifice plates, venturii and weirs flow meters, U-tube differential manometers, and piezometers as the fluid flows through open channels, partially filled conduits, conduits under pressure, pipe networks, turbines and pumps. *Prereq.* MET 1390 or MET 4390; MET 1370 or MET 4370; or concurrently.

MET 1393 Technology Laboratory C 2 QH

Explores basic thermodynamic relations. Experiments examine the flow of compressible fluids and steam and the energy conversion of a fuel into a working substance and the related heat-transfer mechanisms. Discusses operating characteristics of thermal generators, engines, and compressors. *Prereq.* MET 1390 or MET 4390; MET 1341 or MET 4341; or concurrently.

MET 1394 Technology Laboratory D 2 QH

Presents experiments to examine the operating characteristics and efficiencies of internal combustion engines, brake horsepower, indicated horsepower, friction horsepower, and mean effective pressure. Topics include fuel consumption, torque, ignition timing, manifold pressure, and compression ratios and internal engines as energy conversion systems, and energy conversion of fuels. *Prereq.* MET 1341 or MET 4341; MET 1343 or MET 4343; MET 1393 or MET 4393; or concurrently.

MET 1395 Technology Laboratory E 2 QH

Offers experiment, analytical, and design projects to examine refrigeration, air conditioning, and heating pump cycles. *Prereq.* MET 1342 or MET 4342; MET 1343 or MET 4343; and MET 1390 or MET 4390.

MET 1396 Machine Shop 4 QH

Introduces the study of machines for metal processing, cutting tools, and fluids, machinability, and automatic machinery.

MET 1414 Mechanical Vibrations 4 QH

Examines elements of vibrating systems, one degree of freedom (undamped free and forced vibration from Newton's law of motion and energy methods), natural frequencies, and damped free and forced vibration. Topics include impedance and mobility, systems with more than one degree of freedom; influence coefficients, Lagrange's equations, generalized coordinates, and vibration absorber. *Prereq.* MET 1303 or MET 4303.

MET 1415 Experimental Stress Analysis 4 QH

Explores theory and experimentation showing the application of extensometers and electrical strain gauges as transducers in the field of experimental stress and strain analysis. Presents theory and lab practice on photoelastic methods as applied to classical model analysis and modern coating analysis. *Prereq.* MET 1315 or MET 4315.

MET 1416 Stress Analysis C 4 QH

Discusses curved beam, asymmetrical bending of beams, shear-center and shear stresses on thin sections, composite beams; columns energy absorption and resilience, inertial stresses, impact loading, and deflection of beams by energy methods and bolted fastenings. *Prereq.* MET 1315 or MET 4315.

MET 1444 Power Generation 4 QH

Explores electrical power generation by thermomechanical, electromechanical, nuclear, and hydraulic systems. Analyzes thermodynamic cycles as well as practical deviations from the related ideal processes. Considers accessory and auxiliary equipment use. Studies design, performance, economic factors, and public issues affecting electrical power generation. *Prereq.* MET 1341.

MET 1481 Materials B 4 QH

Focuses on the study of inorganic materials (polymers, glasses, ceramics, cements, wood), and materials having important electrical and magnetic properties. A summary of the most recent applications for the fabrication and uses of both metals and nonmetals. Structures of metals, imperfections, phase diagrams effect of temperature on structure and properties of metals (annealing, recrystallization, recovery, precipita-

tion, diffusion) strengthening mechanisms, mechanical properties of nonferrous metals. Lab experiments in preparation of samples, selection, polishing, and etching; examination of nonferrous metals, use of the microscope, linear analysis construction of cooling curves, and simple binary-phase diagrams. *Prereq.* MET 1380 or MET 4380.

MET 1499 Special Problems in Mechanical Engineering Technology 4 QH

Theoretical or experimental work under individual faculty supervision. *Prereq.* Consent of department chair.

African-American Studies

Please note some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Office of the Dean before taking the course.

Numbers in parentheses within course descriptions refer to core curriculum categories listed on page 3.

AFR 1100 Introduction to African-American Studies 4 QH

Explores several of the possible historical, sociological, cultural, and political avenues of study in the broad interdisciplinary spectrum of African-American studies. Provides an introductory overview of the field and will offer an opportunity to identify areas for more specific focus.

AFR 1131 African-American History I 4 QH

Covers the development of black America from the period of slavery through Reconstruction, with emphasis on the historical links between Africa and America and the impact on black development in the United States. (III)

AFR 1132 African-American History 2 4 QH

Examines the development of black America from Reconstruction to the present, and the effects of events in the United States and world history on the development of black America. Emphasizes contemporary issues and how these issues can be seen through a historical perspective. *Prereq.* AFR 1131 or permission of instructor.

AFR 1133 History of Blacks in the Media and the Press 4 QH

Offers a historical and visual examination of the development of the African-American experience in the American mass media and press. Analyzes contemporary and historical literature, films, and people with respect to history, racism, images, psychology, and social movements. Newspapers, film, television, and radio are prime focal points, and are used to help form strategies for the future of black Americans.

AFR 1141 Education Issues and Minority Communities I 4 QH

Focuses on some of the important issues in today's urban elementary and secondary education systems. The analysis will look at the historical development of these issues, and students will be encouraged to think about and discuss the issues' future significance.

AFR 1150 Black Cultural Development in the United States 4 QH

Focuses on the rise of a distinctive black culture in the United States, with emphasis on examining the premise that the black population in America has developed a cultural system that operates as a subsystem of the American cultural norm.

AFR 1151 Survey of African-American Art 4 QH

Black art, like black literature, has always been an important aesthetic social statement by the African-American artist. This course offers a historical and critical examination of African-American art from the nineteenth century to the present, with special emphasis on the effects of European and African art styles on the black artist in America.

AFR 1153 Survey of African-American Music 4 QH

Black music has evolved in fascinating ways over the past hundred years. Topics include the impact of African rhythm on black music, the New Orleans coalescence, regional development, ragtime, the emergence of large bands, the harmonic revolution of the forties, bebop, the 1960s avant-garde, and subsequent developments. Some analysis of specific jazz phenomena is included. Same as MUS 1104.

AFR 1156 Music of Africa 4 QH

The music of Africa is as varied as that continent's many linguistic and tribal identities. This course will provide a broad survey of the musical traditions of Africa with respect to their historical, social, and cultural backgrounds. Musical organization, musical practice, and aspects of style will all be discussed in light of possible contributions to contemporary African-American music. Same as MUS 1181.

AFR 1161 Economic Issues in Minority Communities 4 QH

Minority lifestyles, perspectives, self-images and social position in the urban community are all

affected by economic factors, especially those specific to the minority poor. Students have the opportunity to examine these issues, particularly in terms of the application of basic economic theories to the economic realities of minority communities. (VI)

AFR 1171 Survey of Contemporary Black Political Movements 4 QH

The modern black political movements were inspired by a full-scale evolution of black political thought in America. Analysis of this evolution examines socio-political contests that have served as catalysts to these modern movements.

AFR 1191 Early African Civilization 4 QH

Studies the ancient empires of Africa, especially Ghana, Songhai, Mali, Zimbabwe, the city states of East Africa, and also the Congo Kingdom. Includes Ethiopian as well as Egyptian history and controversies to 1800.

AFR 1193 Africa Today 4 QH

With increasing numbers of nations striving for economic and political control in Africa, and with imperialist and colonial ideas remaining in the living memory of Africans, Africa presents a complex political and social picture to the rest of the world. This course examines some of the salient features of black art, politics, and identity in Africa.

AFR 1195 Identity and Nationalism in Africa 4 QH

How have centuries of imperialism, the struggle for national unity, and the continuing problems of racism and rivalry between factions affected the present identities and nationalist movements in Africa? This course explores problems peculiar to Africa and to any group of nations struggling against colonial ideas. Tribalism and the effects of European colonial partition on African identity are discussed.

AFR 1196 The Black Experience in the Caribbean 4 QH

Offers a descriptive and interpretive analysis of the growth of the modern black community in the Caribbean. Although the focus will be on the contemporary period, the course will examine that period in the context of colonialism and slavery in the Americas. Important racial, social, political, economic, and religious issues will be addressed.

AFR 1197 Modern African Civilization 4 QH

Explores African history and culture from 1800 to the present era. Emphasis will be placed on the relationship between Europe and Africa, the circumstances surrounding the imperialist partition of Africa, and the decolonization process. This course is the same as HST 1621. (IV)

AFR 1211 African-Americans in Science, Technology, and Medicine 4 QH

Studies the contributions that African-Americans have made to the development of science and technology in America. It examines the cultural and social factors that have encouraged blacks to

work in the fields of science (biology, chemistry, physics) and technology (engineering and medicine). Certification of blacks within the American scientific community and the availability of science to the past and contemporary African-American communities are also explored. Readings, discussions, individual research topics, and interviews with black scientists, inventors/engineers, and doctors are used to develop the basic course material.

AFR 1220 The Black Novel 4 QH

The black novelist belongs to a unique literary group in the history of American fiction. Special attention is given to Chesnutt, Toomer, Wright, Ellison, and contemporary novelists, and to their different perceptions of the black experience in America.

AFR 1235 Black History of Boston 4 QH

Examines the social, economic, political, and educational history of Boston's black community in the nineteenth and twentieth centuries. The development of the black community and its institutions is a major focus, and students are encouraged to study the past in an attempt to understand the present and interpret the future. Research data include participant observation, oral history, interviews, and primary and secondary source materials.

AFR 1240 Contemporary Issues in Black Society 4 QH

Introduces the various issues and problems that confront black Americans, including some of the realities of the social, political, and economic problems of contemporary black experience. Students are asked to assess the validity of specific social theories in relation to the black experience.

AFR 1241 The Black Family 4 QH

How does the black family function, both interpersonally and as a social unit? Anthropological and sociological theories deal with variations in family structure and the function of the black family in black society. The effects of slavery and colonization on the black family structure and functions are also explored. A side issue is a discussion of some of the differences and similarities between African, African-American, and African-Caribbean families.

AFR 1248 Race Relations in America 4 QH

Examines the interrelations of ethnic, cultural, and minority groups in the United States. Focus is on the nature of racial conflicts, discrimination, reverse discrimination, personal and institutional racism, and racial and ethnic stereotyping. Discussion considers avenues of improvement in attitude awareness and change.

AFR 1251 Survey of Black Theater and Drama 4 QH

Theater in America has been an important reflector of the national experience, and black theater, especially in recent years, has served the same purpose for the black community. The course

focuses on the development of black drama during the nineteenth and twentieth centuries, with emphasis on modern developments and their political and cultural significance.

AFR 1261 The Economics of Urban Poverty 4 QH

Like most Americans and people from around the world, blacks migrated to central cities in America to better their economic conditions. However, unlike other migrants to urban centers, they were not assimilated into the social/economic mainstream, and there is evidence of flagrant job, housing, and educational discrimination against them even during periods of affluence. During recession or depression, their problems were compounded. Students have the opportunity to survey the above events from an economic framework.

AFR 1280 Black Psychological Identity 4 QH

So much is said of stereotyping in news, on television programs, and in literature. The shaping of the black identity over three centuries in America is a complicated and perhaps even elusive problem. This course will look at the impact of slavery, racism, war, and poverty on the involvement of the black identity in America.

AFR 1294 Third World Political Relations 4 QH

Offers a comparative regional analysis of the political systems of third world nations of Africa, Asia, Latin America, and the Caribbean. Emphasis is on development strategies; problems of development, including national identity, political socialization and participation, national defense, and urbanization; and the positions of third world nations in the international community.

AFR 1297 Caribbean History 4 QH

Analyzes the development of the Caribbean from slavery to the present. The focus will be on the period 1918-1962 especially, and emphasis will be on the historical analysis of the relationship of the Caribbean with the United States and black Americans.

AFR 1300, AFR 1301, AFR 1310, AFR 1311 Directed Study 4 QH

Directed study offers the ambitious student the opportunity to pursue a special intellectual interest not covered by the department course offerings and to work on this interest with the department faculty member of his/her choice. The faculty member will closely supervise the project and act as adviser for the duration of the quarter.

AFR 1342 Crisis and Conflict in Black Africa 4 QH

Explores contemporary politics in African nations south of the Sahara using films, maps, news clips, discussions, and readings. Studies South Africa, Nigeria, Kenya, and Ethiopia. Examines apartheid, colonialism, Afro-Marxism, chieftancy, economic development, and Pan-Africanism. (VI)

AFR 1350 Research Seminar 4 QH

This course is divided into three parts, providing students the opportunity, first, to identify a substantive area of their concern (for example, welfare, political leadership, education) and to define a related problem in a research context; second, to be supervised in designing a research methodology most appropriate for examining the problem area; and third, to conduct extensive research, test the hypothesis, and draw conclusions based on data analysis techniques.

AFR 1355 Directed Study for Senior Thesis 4 QH

The senior thesis is required of all African-American Studies majors; it offers students the opportunity to prepare a professional research paper under the close supervision of a scholar interested in students' particular research areas. *Prereq. Permission of instructor.*

AFR 1380 Junior/Senior Honors Program 4 QH

For details contact the Honors Office, 215 Lake Hall.

AFR 1401 History of East Africa 4 QH

The first section of the course deals with the precolonial period and the problems of the partition of Africa. The second section focuses on the classical colonial period and the transformations of colonial policy after World War II, with particular emphasis on the ambiguity of decolonization and those features of the colonial system that seem to have become a part of the East African social and political environment.

AFR 1403 History of West Africa 4 QH

The history of West Africa has included the struggle for internal unity, economic development, and social justice. The Pan-Africanist ideology, W.E.B. DuBois's writings, African socialism, and the consolidation of power and leadership are some of the topical objectives in this study of African liberation, particularly the rise of West Africa.

AFR 1405 History of South Africa 4 QH

Initial attention is directed toward pre-colonial South Africa and the conflict between Africans and the Dutch and English settlers. The course then focuses on the formation and transformation of colonial policy after World War II, with particular emphasis on racism, neo-colonialism, liberation movements, and international involvement in the apartheid system. (VI) *Prereq. AFR 1491 or permission of instructor.*

AFR 1421 African-American Literature 2 4 QH

Continues AFR 1127. Focuses on principal writers and their major themes. *Prereq. AFR 1127 or permission of instructor.*

AFR 1448 Religion in Black American Society 4 QH

Black life in America cannot be fully understood without a sense of the importance of religion in the community. This course looks at the impact of religion on social structures, group behaviors, moral codes, and belief patterns in black society. Topics include the church as a social organizer, the role of the black minister in the community, and the variety of black denominations in urban and rural areas.

AFR 1451 Seminar: Creative Expression in Blues and Jazz 4 QH

Blues and jazz have been among the most far-reaching and original artistic expressions of blacks in America. The course touches on possible African sources of inspiration for the musical literature of blues and jazz; a more important focus, however, is on blues and jazz as a reflection of African-American life and on the impact these musical forms have had on black self-image and position in American culture.

AFR 1470 Black Political Thought 4 QH

How do the black people as a unit view the American political system and black people's chances of improving their lot in this country? This course examines black opinions, from the radical to the ultra-conservative, of the United States political system. The focus is historical in context and will address notions of political socialization and the development of black political ideologies.

AFR 1480 Black Man/Black Woman 4 QH

Sociological and anthropological methods are used to examine black male and female personality

development as well as the development of black male and female behavior, self-image, sexual roles, and behavior within both the black and the white communities.

The following courses may be of interest to the student wishing to concentrate in African-American Studies. Descriptions for these courses may be found in the appropriate department listing.

PHL 1100 Introduction to Philosophy 1**PHL 1140 Social and Political Philosophy****PHL1243 Existentialism****PHL1335 Moral Philosophy****POL 1303 Political Behavior****POL 1317 Law and Society****POL 1320 Parties and Elections****POL 1342 African Politics****POL 1362 Civil Liberties****POL 1386 International Law****SOA 1345 People in Cities****SOC 1147 Cities and Society****SOC 1170 Race and Ethnic Relations****SOC 1310 Class, Power, and Social Change**

American Sign Language

Please note that some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course overlaps another, please consult the respective departments and the Office of the Dean before taking the course.

American Sign Language courses are an integral part of two undergraduate degree programs: the human services specialization in deaf studies and the linguistics major. For more information, contact the American Sign Language Program, 276 Holmes Hall. See also human services and linguistics majors.

ASL courses do not satisfy the College of Arts and Sciences modern foreign language requirement for the BA, but they do satisfy humanities requirements of many major programs. Many students take ASL courses as free electives for personal or professional enrichment.

ASL 1101 American Sign Language 1 4 QH

Introduces American Sign Language and deaf culture, focusing on frequently used signs, basic rules of grammar, nonmanual aspects of ASL, and some cultural features of the deaf community.

ASL 1102 American Sign Language 2 4 QH

Continues basic language and culture study. Offers an opportunity to build receptive and expressive sign vocabulary. Topics include use of the signing space; further use of nonmanual

components, including facial expression and body postures. Introduction to fingerspelling. *Prereq.* ASL 1101 or permission of instructor.

ASL 1201 Intermediate American Sign Language 1 4 QH

Emphasizes further development of receptive and expressive skills, fingerspelling, vocabulary building, grammatical structures; encourages more creative use of expression, classifiers, body postures, and the signing space. Introduction to

regional and ethnic sign variations and political and educational institutions of the deaf community. *Prereq.* ASL 1102 or permission of instructor.

ASL 1202 Intermediate American Sign Language 2 4 QH
Offers intensive practice involving expressive and receptive skills in story telling and dialogue. Introduces language forms used in ASL poetry and to the features of culture as they are displayed in art and the theatre. *Prereq.* ASL 1201 or permission of instructor.

ASL 1211 Deaf Culture 4 QH
Focuses on the status of deaf people as a linguistic and cultural minority group. Topics include the role of American Sign Language in the deaf community; educational and historical perspectives on deafness; and sociological and cultural make-up of the deaf community. *Prereq.* ASL 1101.

ASL 1212 Deaf History 4 QH
Surveys the history of deaf people in the Western world, with emphasis on the American deaf community, their language, education, and relationship to hearing society.

ASL 1301 Advanced American Sign Language Proficiency 4 QH
Emphasizes vocabulary building and mastery of fine points of grammar through rigorous receptive and expressive language activities. Includes

student-led discussions, debates, and reports on topics in deaf culture, society, and current affairs. *Prereq.* ASL 1202 or permission of instructor.

ASL 1401 American Sign Language Literature 4 QH
Various genres of American Sign Language will be read and discussed in ASL. This course will concentrate on the work of current, recognized narrators in both literary and face to face storytelling traditions, and will also include selected autobiographical sketches, lectures, stories, and letters from the early 1900s by such historical figures as Clerc, Veditz, E.M. Gallaudet, and others. A videotaped research essay in ASL will be required at the end of the course. *Prereq.* ASL 1202.

ASL 1801, ASL 1802, ASL 1803, ASL 1804, ASL 1805 Directed Studies 4 QH each
Directed studies offer students an opportunity to go beyond course work of the regular curriculum or to pursue an individual learning project. May include research, practicum, or language development activity.

Art and Architecture

Please note some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Office of the Dean before taking the course.

Numbers in parentheses within course descriptions refer to core curriculum categories listed on page 3.

ART 1100 History of Art to 1400 4 QH
Provides a survey of Western art from prehistoric times to the Renaissance.

ART 1101 History of Art Since 1400 4 QH
Surveys Western art from the Renaissance to the twentieth century.

ART 1106 Introduction to Art 4 QH
Offers an introduction to the characteristics of the visual arts, including painting, sculpture, graphic arts, and architecture. Various examples of works of art are studied as an introduction to style and technique. Includes visits to museum collections and contemporary art galleries. (II)

ART 1111 Introduction to Architecture 4 QH
Introduces the history, theory, and practice of architecture. Shows how architects in different historical periods have balanced the demands of function, construction and aesthetics. Lectures

concentrate on such specific designs problems as found in churches, houses, skyscrapers, and cities.

ART 1124 Basic Drawing 4 QH
Offers intensive drawing instruction. Focuses on developing a formal understanding of the structure of objects and figures as well as increased dexterity with a variety of drawing tools. Includes experiments with materials such as wash, charcoal, and pencil.

ART 1127 Basic Painting 4 QH
Presents an introductory studio course in the fundamental techniques of painting. Formal problems in the study of color, light, space systems, form, and composition establish the foundation for more individual creative expression. Critiques and slide lectures are used as needed.

ART 1130 Visual Studies Foundation 1**4 QH**

Offers an introductory lecture/studio course clarifying basic principles, language, and concepts inherent in visual language systems. Concentrates on two-dimensional media including photography, painting, video, and film as related to the fundamentals of composition, space relationships, effects of color, form, pattern repetition, structure, figure-ground relationships, balance, and unity.

ART 1131 Visual Studies Foundation 2**4 QH**

Explores three-dimensional form. Examines principles including mass, volume, line, plane, and texture. Introduces basic materials and structure through constructing models and prototypes. Presents sequential exercises with simple eye/hand skills and form recognition. Explores complex projects that require an understanding of context, content, and developing original forms. *Prereq.* ART 1124 and ART 1130.

ART 1132 Principles of Graphics**4 QH**

Offers intensive study in graphic form principles through assigned problems, critiques, and lectures that emphasize formal and conceptual understanding. Develops the visual problem-solving process including comprehending problem objectives, working to specifications, investigating alternatives, and presenting professionally crafted solutions.

ART 1134 Typography**4 QH**

Introduces letterforms in visual communication. Studies typography as form, typographic contrast principles, text organization and hierarchy, the typographic grid, legibility, and letterspacing. Explores the history and variety of typefaces. Includes assigned projects, readings, and lectures.

ART 1150 Architectural Design 1**4 QH**

Introduces fundamental design principles and their application to the built environment. Lectures, two- and three-dimensional design projects, and field trips. *Prereq.* ART 1156.

ART 1151 Architectural Design 2**4 QH**

Continues ART 1150. Introduces the principles of climate, site, human factors, codes, building materials and systems, structure and economy. The creation of three-dimensional small-scale environmental design projects offers experience in analyzing and synthesizing the elements of architecture by developing and evaluating design alternatives. Studies design processes and presentation techniques. Includes field trips, readings, lectures, and individual and group discussions. *Prereq.* ART 1150.

ART 1156 Architectural Drafting**4 QH**

Introduces architectural drafting techniques, tools, materials, lettering, and dimensioning. Students will be expected to make orthographic, axiometric, one- and two-point perspective drawings.

ART 1160 Introduction to Photography**4 QH**

Explores the basics of black and white photography. Introduces the 35mm camera, negative processing, and black and white printing in the department's state-of-the-art lab. No camera nor previous photography experience required.

ART 1170 Filmmaking Workshop**4 QH**

Introduces students to the nature and creative uses of video. Examines video's technological foundation, conventions, and aesthetic potential. Emphasizes weekly hands-on lab assignments and substantive final project. Includes lectures, screenings, and critiques. Facilities and equipment are provided by the department.

ART 1180 Video Basics**4 QH**

Introduces the fundamental nature of the video medium and its creative use. Examines the technological foundation of video, the established conventions of effective field and studio production techniques and postproduction techniques (electronic editing), and explores the aesthetic potential of both the visual and auditory aspects of video. Emphasizes weekly hands-on lab assignments with a final substantive video project required of each student. Facilities and equipment are provided.

ART 1190 Introduction to Computer Graphics**4 QH**

Introduces visual problemsolving with computers. Emphasizes the medium's special properties and its potential. *Prereq.* ART 1130 and ART 1131 or permission of instructor.

ART 1203 Medieval Architecture**4 QH**

Studies the major religious and secular buildings of the Early Christian, Byzantine and Gothic periods, emphasizing Gothic architecture of France and England.

ART 1204 Renaissance Architecture**4 QH**

Studies architecture and urban form in Italy between 1400 and 1600. Examines major Renaissance architecture in France and England.

ART 1205 Renaissance Art**4 QH**

Surveys Italian painting and sculpture from the early fourteenth century to the end of the sixteenth century. Emphasizes the work of Masaccio, Botticelli, Donatello, da Vinci, Michelangelo, and Titian.

ART 1210 Nineteenth Century Painting**4 QH**

Examines European painting and related arts including the neoclassical, romantic, realist, and impressionist movements. Emphasizes French painting, but also considers important developments in England and other western European countries.

ART 1213 Modern Art**4 QH**

Traces the development of painting, sculpture, and related arts from European avant-garde in the late nineteenth century to the international market of the late twentieth century. Topics

include challenges to traditional boundaries between media, the development of abstraction and the idea of pure form, and the recent emergence of a post-modern aesthetic.

ART 1220 American Art 4 QH

Surveys the history of American painting and sculpture from the seventeenth century to the present. Focuses on the cultural forces that shape the evolution of art in America. Includes frequent museum visits.

ART 1223 American Architecture 4 QH

Introduces American architecture, town planning, and urban design from the 1700s to the 1930s. Considers European influences and uniquely American contributions.

ART 1225 Modern Architecture 1 4 QH

Surveys the development of modern architecture in England, France, Germany, and the United States from the mid-eighteenth to the late nineteenth century. Discusses architecture and urban design as a cultural response to society's changing conditions. Considers such themes as symbolism, morality, rationalism, and functionalism. *Prereq. ART 1111 or permission of instructor.*

ART 1228 Modern Architecture 2 4 QH

Examines the forms and principles of European and American architecture of the twentieth century, emphasizing the work of such key figures as Frank Lloyd Wright, Mies van der Rohe, Le Corbusier, and Louis Kahn; and such influential movements as the Dutch de Stijl, Russian constructivism, and American post-modernism.

ART 1230 History of Photography 4 QH

Explores photography from its origins in the early nineteenth century to its maturity in the mid-twentieth century. Surveys technological developments but emphasizes the emergence of photography as an expressive medium and its relation to other modern art forms.

ART 1233 Contemporary Directions in Photography 4 QH

Studies prevailing trends in photographic artistic expression from the beginning of the twentieth century to the present. Examines the importance of photographic imagery in relation to our surroundings through lecture and slide presentations.

ART 1235 History of Film 4 QH

Surveys major international developments in film from the late nineteenth century to the present. Examines national movements, technological and aesthetic innovations, important figures, and significant films. Includes films, lectures, and discussions.

ART 1236 American Film 4 QH

Surveys the rise of the American film from the late nineteenth century to the present. Examines key films, directors, major themes, and film forms and

techniques. Includes lectures, screenings, and discussions.

ART 1240 History of Graphic Design 4 QH

Considers the history, context, and issues of graphic design through lectures, readings, discussions, and projects. *Prereq. ART 1101.*

ART 1241 Advertising Design 4 QH

Explores the principles and practices of advertising through projects, lectures, readings, discussions, and in-class presentations and workshops. *Prereq. ART 1132 and ART 1134.*

ART 1243 Graphic Design 2 4 QH

Investigates the expressive visual potential of words and images. Explores visual poetry, the connotations of mark and form choice, and applied semiotics. Includes assigned projects, readings, discussions, and lectures. *Prereq. ART 1133 and ART 1250.*

ART 1250 Color Theory and Practice 4 QH

Focuses on the optical phenomena of color and their application in visual communication. Studies hue, value, and saturation, and their implications for color activity, legibility, and spatial illusion in traditional and electronic media.

ART 1252 Architectural Design 3 4 QH

This intermediate architectural studio course allows the student to integrate the principles of ART 1150 and ART 1151 in projects of increasing complexity. Design projects of moderate scope emphasize the coordination of program, site, structure, environmental systems, construction processes, and materials. Both urban and suburban sites will be used for a minimum of two architectural projects that offer the student architectural design problems based on actual sites, building programs, and construction regulations.

ART 1253 Architectural Design 4 4 QH

Continues ART 1252 in the architectural studio series. Requires students to apply design principles to increasingly complex architectural problems. Focuses on mixed-use programs for urban sites in the studio's architectural design project. *Prereq. ART 1252.*

ART 1254 Intermediate Drawing 4 QH

Focuses on heightening the student's understanding of spatial awareness, scale movement, and expression. Students will be asked to create unusual environmental situations for their figurative compositions. A variety of media will be used, including wash, pen and ink, watercolor, chalk, charcoal, and pencil. *Prereq. ART 1124 or equiv.*

ART 1256 Theory of Structures 1 4 QH

Introduces the theory of materials and structures. Examines basic structural elements in masonry and wood construction. Uses historic and current

building types to explore the relationship between structure, materials, construction process, and architectural space. Includes lectures, discussions, field trips, and student presentation of structural models and diagrams. *Prereq. PHY 1222.*

ART 1257 Theory of Structures 2 4 QH

Continues ART 1256, combining the basic structural elements to develop structural systems. Explores form, stability loading, and materials in relation to the design of foundation, structural steel, reinforced concrete, timber, frame, space frame, and shell systems. *Prereq. ART 1256 and PHY 1222.*

ART 1261 Intermediate Black and White Photography 4 QH

The second-level black and white photography studio/lab course with emphasis on combining personal aesthetic choices with refined darkroom skills. The zone system for roll film cameras, toners, fiber based papers and alternative film choices will be demonstrated and assigned. A final portfolio is required for successful completion of the course. Lab fee. *Prereq. ART 1160 or equiv.*

ART 1263 Introduction to Color Photography 4 QH

Introduces shooting, processing, and printing color negative films. Lectures cover basic color theory in relationship to photography as well as contemporary color photographic processes. Working with color negative films, students get hands-on experience in the C-41 process for developing film and the EP-2 process for printing color negatives. Weekly assignments emphasize solving technical and aesthetic problems inherent in dealing with color negative materials. Hands-on labs allow students to produce final projects. Color chemistry and facilities are provided. *Prereq. ART 1160 or equiv.*

ART 1265 Color Slide Production and Printing 4 QH

Introduces shooting, processing, and printing color slide films. Lectures include slide presentations, demonstrations of the E-6 and Cibachrome processes, and critiques of student work. Weekly assignments emphasize solving technical and aesthetic problems inherent in dealing with color slide materials. Hands-on labs allow students to produce final projects. Color printing supplies and facilities are provided for student use. Lab fee. *Prereq. ART 1160 or equiv.*

ART 1280 Media Graphics 4 QH

Offers applied video design projects. Develops visual logic, sequence, motion, and legibility. Includes assignments, demonstrations, and lectures. *Prereq. ART 1180 and ART 1243.*

ART 1281 Video Project 4 QH

Offers in-depth exploration of the video medium. Students research, write, and produce a documentary, fictional narrative, or experimental video

project. Emphasizes innovation, personal authorship, effective research, sound conceptual development, formal and technical skills, and imaginative and creative soundtracks and visuals in video. *Prereq. ART 1180 or equiv.*

ART 1290 Electronic Publishing Design 4 QH

Investigates publication and periodical design issues including concept development, sequence, organization, page design, typography, and the typographic grid. Includes assignments using page layout software in the computer labs. *Prereq. ART 1132, ART 1134, and ART 1190 or equiv.*

ART 1291 Intermediate Computer Graphics Workshop 4 QH

Offers the opportunity to pursue individual projects and assigned studies in the computer environment. *Prereq. ART 1190 or equiv.*

ART 1295 Computer-Aided Design 4 QH

Introduces CAD processes for two- and three-dimensional modeling for architectural design. Studies computer-aided design techniques that support site and program analysis concept and schematic design, and design development and construction drawing applications.

ART 1310 Seminar in Modern Architecture 4 QH

Explores contemporary issues in architectural theory, design, and practice. Examines historical forces and contemporary criticism to define the nature of modernism and post-modernism. Focuses on such architects as Louis Kahn, IM Pei, Philip Johnson, Robert Venturi and Denise Scott-Brown, Michael Graves, and Frank Gehry. *Prereq. ART 1228 or permission of instructor.*

ART 1330 Advanced Visual Communication 4 QH

Presents an advanced interdisciplinary studio seminar in visual and media design. In a chosen area of specialization, students explore their capabilities through the practical application of conceptual and technical skills. Lab fee. *Prereq. Permission of instructor.*

ART 1355 Environmental Systems 4 QH

Surveys the environmental systems of power, air, water, waste, and light as integral elements of architecture. Discusses the theory and practice of these systems in architectural design. Considers historical and contemporary examples of building systems that illustrate the function, technology, and aesthetics of environmental systems. Includes field trips, lectures, and individual student research projects. *Prereq. ART 1252.*

ART 1363 Advanced Photography Seminar 4 QH

Through close interaction with the teacher, students are asked to refine their technical skills and to make meaningful decisions about their relationship to the world around them through the use of black and white and/or color photography.

Portfolio preparation, alternative processes, and large format will be combined to form a base of skills with which to present the student's work to a larger photographic community. This course stresses individual direction and a qualitative approach to substantive photography. *Prereq.* *Permission of instructor.*

ART 1713 Modern Art: Honors 4 QH
Combines in-depth investigation of selected modern artists and movements with an overview of the diverse meanings and functions of modern art. Involves developing and presenting individual research projects. *Prereq.* *Honors status or permission of instructor.*

ART 1800, ART 1801, ART 1802 4 QH each
Directed Study

Offers independent work under the direction of members of the department on a chosen topic. Limited to qualified junior and senior students majoring in art, with approval of the department.

ART 1810, ART 1811, ART 1812 4 QH each
Junior/Senior Honors Program

For details contact the Honors Office, 215 Lake Hall.

Biology

For specific information about terms during which courses are offered, students should inquire at the main office of the biology department, 414 Mugar Building. This is especially the case for students wishing to carry a minor in biology, since some courses acceptable only for a minor do not appear in the quarterly Elective Course Selection booklets. Students should note that courses are presented by category and are not listed in a single numerical sequence.

Students should be aware that two (or more) courses with substantially the same content may not be counted toward quantitative graduation requirements. Some instances of overlap between biology courses are noted in the individual course descriptions below. However, in addition, certain combinations of courses (for example, BIO 1150 and BIO 1151 and BIO 1253, BIO 1254, and BIO 1255) may cover essentially the same material, and certain courses in other departments of the University may duplicate certain biology courses. If a student is not sure whether particular courses overlap, the student should seek advice from departmental advisers or the Office of the Dean.

Numbers in parentheses within course descriptions refer to core curriculum categories listed on page 3.

The following courses are primarily for students with little or no background in college science and mathematics. These courses are not open to biology majors.

BIO 1111 Environment and Man 4 QH
Offers an ecological analysis of man's interaction with other organisms. Presents the necessary foundation of biological principles. *Not open to biology majors.*

BIO 1150 Human Anatomy and Physiology 1 5 QH
Focuses on cellular and tissue structure and function, and anatomical terminology. Topics include histology, anatomy, and physiology of bones, muscles, blood, and nervous systems. Lab includes a study of human bones, cat dissection, and related histology. Lab fee. *Not open to biology majors.*

BIO 1151 Human Anatomy and Physiology 2 5 QH
Covers anatomy and physiology of the respiratory, digestive, urogenital, and circulatory systems; physiology of endocrine system; a brief exploration of the anatomy and physiology of eye and ear. Lab includes studies of muscle and nerve physiology, blood physiology and histology, and physiology of respiration. Lab fee. *Prereq.* *BIO 1150; not open to biology majors.*

BIO 1152 Integrated Human Anatomy and Physiology 1 4 QH

Introduces students to human anatomy and physiology. Focuses on cell and tissue structure and function; and anatomy and physiology of the integument, nervous system, vision and hearing, and skeletal system. Lab. *Not open to biology majors.*

BIO 1153 Integrated Human Anatomy and Physiology 2 4 QH

Presents the structure and function of the following systems: muscular, endocrine, reproductive, vascular, and immune. Lab includes cat dissection. *Not open to biology majors.*

BIO 1154 Integrated Human Anatomy and Physiology 3 4 QH

Presents the structure and function of the cardiovascular, respiratory, urinary, and digestive systems and the regulation of metabolism and body temperature. Lab includes cat dissection. *Not open to biology majors.*

BIO 1181 The Human Organism 4 QH

Designed for nonscience majors, introduces the structure and function of the human body. Emphasizes the principles of biological and physical science as they relate to life processes in

health and disease. Lab experiments explore the workings of the students' own biological systems rather than those of other animals. Lab fee. **II** *Not open to biology majors.*

BIO 1187 Biology of Human Reproduction 4 QH

Covers structure and function of male and female reproductive systems; factors affecting sexual development, fertility, and reproductive behavior in the human species; physiology of coitus, fertilization, pregnancy, birth, and lactation; methods of controlling fertility; and sexually transmitted diseases. **III** *Not open to biology majors.*

The following courses are primarily for students majoring in science or health-related professions or other majors nonbiology with equivalent background in college science and mathematics. These courses are not open to biology majors.

BIO 1112 Ecological Principles 3 QH

Identical to BIO 1211, but without lab. *Not open to biology majors. II* Prereq. Nonbiology science majors or engineering majors.

BIO 1115 Introduction to Human Biology 4 QH

Introduces students to cell biology, genetics, and animals, such as roundworms, that cause health problems. Lab. *Not open to biology majors.*

BIO 1120 Basic Microbiology 4 QH

Microbial life, emphasizing morphological characteristics, physiological activities, and disease production. Lab. Overlaps BIO 1220, BIO 1121, and BIO 1221. Lab fee. Prereq. BIO 1126, or permission of instructor. *Not open to biology majors.*

BIO 1121 Introductory Microbiology 3 QH

Same as BIO 1120, but without lab. *Not open to biology majors.*

BIO 1140 Basic Animal Biology 1 4 QH

Covers principles of biology, universal properties and processes of living organisms as exemplified by the cell and its activities, inheritance, evolution, and environmental relationships. Lab. Lab fee. Overlaps BIO 1106. *Not open to biology majors.*

BIO 1141 Basic Animal Biology 2 4 QH

Offers systematic, comparative study of the structure and functions of animals. Considers the diversity of animals from the standpoint of evolutionary adaptation. Lab. Lab fee. Overlaps BIO 1107. Prereq. BIO 1140. *Not open to biology majors.*

BIO 1171 Focus on the Sea: Issues and Nature 2 QH

Explores marine conservation issues through lectures, discussion, and field trips to coastal habitats and islands. Studies the sea from ecological, economic, and literary perspectives.

BIO 1175 Introduction to Marine Biology 4 QH

Offers a broad introduction to the field emphasizing principles of oceanography and marine biology.

Presents the physical, geological, and biological aspects of the ocean. Discusses the diversity of marine life and how organisms interact within different marine communities. **II** *Not open to biology majors.*

BIO 1221 General Microbiology 3 QH

Same as BIO 1220, but without lab. Not applicable for the biology major or graduate credit. Prereq. Permission of instructor, or CHM 1265, BIO 1260, and BIO 1261; required courses may be taken concurrently.

BIO 1255 Human Anatomy 4 QH

Focuses on the structure and development of the human body. Lab. Lab fee. *Not open to biology majors.*

Courses primarily for biology majors or for other students with equivalent background in college science and mathematics. Freshmen intending to major in biology should take the sequence BIO 1103 to BIO 1105.

BIO 1103 Principles of Biology 1 5 QH

Introduces the basic principles of biology, offering an information base for the remainder of the biology core. Topics include scientific method, cell metabolism, growth, development, elementary genetics, nutrition, photosynthesis, and respiration. Lab. Lab fee.

BIO 1104 Principles of Biology 2 5 QH

Topics include structure and function of animals, structure and general physiology of animal cells, and evolution of adaptive diversity of animals. Lab fee. Prereq. BIO 1103.

BIO 1105 Principles of Biology 3 5 QH

Discusses the molecular mechanisms of microbial and plant life. Introduces the various systems of plants and their role in the biological world. Illustrated with lab experiments and dissection. Lab fee. Prereq. BIO 1103 and BIO 1104.

BIO 1106 General Biology 4 QH

Focuses on universal properties and processes of living organisms. Topics include cellular composition and cellular control, the evolutionary process, and environmental relationships. Lab. Lab fee. Normally not for freshman biology majors. Overlaps BIO 1140.

BIO 1107 Animal Biology 4 QH

Offers a systematic comparative study of the structure and functions of animals. Considers the diversity of animals from the standpoint of evolutionary adaptation. Lab. Lab fee. Normally not for freshman biology majors. Overlaps BIO 1141. Prereq. BIO 1105.

BIO 1133 Plant Biology 4 QH

Introduces the structure of plant cells, structure and function of roots, stems, and leaves of flowering plants. Survey of the major groups in the plant kingdom, including their morphology.

reproductive biology, and economic importance. Lab. Lab fee. *Prereq.* BIO 1106 and BIO 1107 or BIO 1103 through BIO 1105.

BIO 1211 Environmental and Population Biology 4 QH

Considers the physicochemical factors influencing and influenced by organisms. Covers interactions among individual organisms and among species; change of species by genetic natural selection; development of communities and function of ecosystems. Lab. Lab fee. *Prereq.* BIO 1106 and BIO 1103 or BIO 1103 through BIO 1105.

BIO 1253 Human Physiology I 4 QH

Offers study of the physiology of excitable cells and tissues: nerve and muscle synapses, muscular contraction, neuromuscular reflexes, autonomic nervous system, endocrinology, sensory physiology, and higher nervous function. Lab. Lab fee. *Prereq.* BIO 1106 and BIO 1107 or BIO 1103 through BIO 1105.

BIO 1254 Human Physiology 2 4 QH

Offers study of respiration and circulation, fluids, the heart, cardiovascular regulatory mechanisms and metabolism, gastrointestinal function, renal function. Lab. Lab fee. *Prereq.* BIO 1253.

BIO 1260 Genetics and Developmental Biology 4 QH

Focuses on elaboration of the classic laws of heredity, cytogenetics, molecular basis of heredity, and selected examples of the development of form and function. Lab. Lab fee. *Prereq.* BIO 1107–BIO 1133 or BIO 1103–BIO 1106 and CHM 1264.

BIO 1261 Cell Physiology and Biochemistry 4 QH

Topics include basic chemical and physical enzyme kinetics; processes of cells related to their fine structure; oxidative and intermediary metabolism, photosynthesis, membrane phenomena; chemical and physical processes of prokaryotic and eukaryotic cells. Lab. Lab fee. *Prereq.* BIO 1107 or BIO 1103–BIO 1106 and BIO 1260, CHM 1265, and CHM 1221.

BIO 1270 Diving Research Methods 4 QH

A field-oriented course designed to introduce students to techniques in the study, ecology, and physiology of subtidal marine organisms. The course will consist of the description of underwater research methods, their appropriate applications, and their implementation during field exercises under water. Topics to be covered include diving physiology, sampling design, experimental design, statistical analysis of data, population censusing methods, under water measurements of hydrodynamics, in situ respirometry, underwater telemetry, underwater photography, and the use of underwater habitats and submersibles in research. Lab fee. *Prereq.* Scuba certification.

BIO 1311 Evolution 4 QH

Focuses on evolutionary history, evidence, mechanisms, and theories. Topics of current interest in evolution are emphasized. Lab fee. *Prereq.* BIO 1106 or BIO 1103 and BIO 1260.

BIO 1312 Marine Ecology 4 QH

Studies marine habitats and organisms. Focuses on primary and secondary productivity and community structure and dynamics. Emphasizes through field work the Pacific Northwest intertidal and shallow subtidal communities. Oregon East West program. *Prereq.* Two years of college biology.

BIO 1320 General Microbiology 5 QH

Provides morphological, ecological, and biochemical consideration of representative groups of bacteria. Introduces virology and microbial genetics; host-parasite relationships, including basic immunological considerations; prokaryotes of medical significance; and physical and chemical controls of microbial growth. Lab. Overlaps BIO 1110 and BIO 1101. Lab fee. *Prereq.* Permission of instructor; or CHEM 1245, BIO 1260, or BIO 1261, required courses may be taken concurrently.

BIO 1328 The Microbial World 4 QH

Studies the position, structure, and function of microorganisms in the natural world, and their utilization by humans from the perspective of their major physiological properties. Lab. Lab fee. *Prereq.* BIO 1211 and CHEM 1244.

BIO 1329 Marine and Fresh Water Microbiology I 2 QH

Examines methodological approaches to the study of the aquatic environment. Shipboard sampling and relevant field trips augment lab studies. Lab fee. *Prereq.* BIO 1320.

BIO 1330 Marine Botany 4 QH

Explores taxonomy of the major groups of marine plants, primarily algae. Investigates ecological and reproductive strategies, economic importance, and roles in diverse marine communities. Mandatory field trips in addition to lab. Lab fee.

BIO 1341 Vertebrate Zoology 4 QH

Emphasizes the systematics, natural history, zoogeography, and behavior of all classes of vertebrates. Labs consist of study of specimens and field and museum trips. Lab fee. *Prereq.* BIO 1107 or BIO 1104 and BIO 1103.

BIO 1347 Embryology 5 QH

Topics include gametogenesis, fertilization, cleavage, gastrulation, induction, organogenesis, and metamorphosis in vertebrates. Emphasis is on frog, chick, and pig in the lab. Lab fee. *Prereq.* BIO 1107 or BIO 1105 and BIO 1260.

BIO 1348 Animal Histology 4 QH

Offers microscopic study of fundamental types of animal tissues. Lab. Lab fee. *Prereq.* BIO 1265 or BIO 1267.

BIO 1350 Regulatory Physiology 5 QH

Introduces physiological control systems including transport processes, cellular basis of nerve function, action of chemical messengers and regulators, and principles of cellular communication.

and motility. *Prereq.* BIO 1103 and BIO 1104, or BIO 1106 and BIO 1107.

BIO 1351 Comparative Vertebrate Anatomy 5 QH

Focuses on morphology and phylogeny of the vertebrates. Lab studies taxonomy of the group and specific morphology of the dogfish shark, the mud puppy, the alligator, and the cat. Lab fee. *Prereq.* BIO 1105 or BIO 1107.

BIO 1370 Marine Invertebrate Zoology 5 QH

Topics include functional morphology, systematics, ecology, and phylogenetic relationships of the major invertebrate phyla. Lab emphasizes utilization of living marine forms, with dissection of representative organisms. Lab fee. *Prereq.* BIO 1105 or BIO 1107.

BIO 1371 Biological Oceanography 4 QH

Offers labs and lectures encompassing the principles of biological oceanography. Topics include physical and chemical aspects of the ocean environment, the distribution, production, and interactions of marine planktonic organisms, and ecosystem characteristics of specific oceanographic environments. Emphasizes participation in sampling and analysis using current instrumentation and methods. Lab fee. *Prereq.* BIO 1104, BIO 1107, or BIO 1141 or equiv.

BIO 1411 Tropical Terrestrial Ecosystems 3 QH

Introduces students to the plants, animals, and ecosystems of terrestrial Jamaica. *Prereq.* Two years of college biology.

BIO 1412 Benthic Marine Ecology 4 QH

Examines the interactions among bottom-dwelling invertebrates, fish, and plants and their environment. Quantitative field methods and new developments in ecological theory will be applied to examinations of the rocky intertidal zone, soft sediment areas, salt marshes, and the rocky subtidal zone. Lab fee. *Prereq.* BIO 1211; BIO 1341 recommended.

BIO 1420 Microbial Physiology 4 QH

Focuses on structure and function of the bacterial cell, emphasizing its general properties as well as on the physical and chemical factors that influence it. Lab. Lab fee. *Prereq.* BIO 1320 or equiv.

BIO 1427 Medical Microbiology 4 QH

Topics include host parasite interactions: virulence, toxins, natural flora, immunological responses; characteristics of the common bacterial, rickettsial, and protozoal infections in humans; epidemiology, pathology, vaccines, and chemotherapy. Lab fee. *Prereq.* BIO 1320 or equiv.

BIO 1430 Plant Physiology 4 QH

Focuses on the physiology and biochemistry of plants as a whole and at the cellular and organ levels. Considerations of mineral and nutrition, photosynthesis, hormones, growth, and development are included. Attendance at a weekly

four-hour lab, as well as preparation of a paper based on the research literature, is required. *Prereq.* BIO 1105 or BIO 1133 and CHM 1265.

BIO 1432 Higher Plants 4 QH

Offers study of vascular plants (club mosses, ferns, gymnosperms, and angiosperms). Origin, ecology, development, structure, paleobotanical evidence, reproductive strategies, and economic uses. Field trips included. Lab. Lab fee. *Prereq.* BIO 1105 or BIO 1133.

BIO 1437 Structural Botany 4 QH

Focuses on comparative developmental anatomy of seed plants. Lab. Lab fee. *Prereq.* BIO 1105 or BIO 1133.

BIO 1440 Advanced Invertebrate Zoology 4 QH

A lecture, field, and lab course that concentrates on one or two phyla. Subject varies from year to year, depending upon expertise of available faculty. An individual research project is required. Lab fee. *Prereq.* Two years of college biology.

BIO 1441 Parasitology 4 QH

Focuses on symbiotic relationships of protozoans, mesozoans, flatworms, nematodes, acanthocephalans, and arthropods. Lab. Lab fee. *Prereq.* BIO 1107 or BIO 1105 and BIO 1260.

BIO 1442 Vertebrate Paleontology 4 QH

Examines evolution of the vertebrates, including humans, as revealed through the fossil record. Lab, museum, and field studies. Lab fee. *Prereq.* BIO 1107 or BIO 1105, BIO 1211, BIO 1260; or permission of instructor.

BIO 1446 Ornithology 4 QH

A study of the phylogeny, anatomy, physiology, behavior, and ecology of birds. Field observation, lab preparation, and study of specimens are included. Lab includes on-campus study and field trips. Lab fee.

BIO 1447 Herpetology 4 QH

Lectures emphasize the natural history, behavior, systematics, and zoogeography of recent amphibians and reptiles. Lab consists of identification and preparation of specimens, particularly local species. Mandatory field trips. Lab fee. *Prereq.* BIO 1105 or BIO 1107, and BIO 1260.

BIO 1448 Mammalogy 5 QH

Offers study of phylogeny, anatomy, physiology, and natural history of mammals. Field collection, lab preparation, and study of specimens are included. Lab. Lab fee. *Prereq.* BIO 1104 or BIO 1107, and BIO 1211.

BIO 1449 Marine Birds and Mammals 4 QH

Focuses on the phylogeny, systematics, zoogeography, morphology, physiology, reproduction, behavior, and ecology of birds and mammals associated with the marine environment, with lab emphasis on species that occur along the New

England coast. Labs include identifying, dissecting, and preparing specimens. Lab fee. *Prereq.* BIO 1211 and BIO 1104, BIO 1107, or BIO 1141.

BIO 1450 Immunology 4 QH

Provides an overview of the structure and function of genes, proteins, and cells involved in the generation of the immune response. Emphasizes molecular immunology and immunogenetics. *Prereq.* BIO 1261. Take concurrently with BIO 1467.

BIO 1453 General Physiology of Invertebrates 4 QH

Basic animal functions as manifested among the major groups of invertebrates, with comparisons to the vertebrates, especially aquatic vertebrates. The course considers the cellular and biochemical bases for the functions, their control, their adaptiveness to diverse environments, and their evolutionary implications. Topics usually include: respiration, circulation, nutrition, metabolism, excretion, salt and water balance, temperature responses, biological clocks, sensory organs, and various effector organs. Lab fee. *Prereq.* BIO 1261.

BIO 1454 Comparative Vertebrate Physiology 4 QH

Considers physiological principles in the context of the phylogenetic diversity of the vertebrates, with emphasis on adaptations of animals to aspects of their life histories and environments. Comparisons with invertebrate systems will be made when appropriate. Major themes to be considered include: energetics, temperature, circulation, respiration, skeletal muscle, and salt and water balance. Lab. Lab fee. *Prereq.* BIO 1261.

BIO 1457 Neuroethology 4 QH

A lecture, field, and lab course concentrating on the mechanisms underlying behavior of model invertebrates and lower vertebrates. The overall goal will be to develop a framework to explain behavior in terms of properties and connectivity of neuronal circuits. Topics to be covered include: the cellular biology of neurons and neuronal circuits, the organization of sensory and motor systems, and field and lab analysis of simple behaviors. Lab fee. *Prereq.* BIO 1105.

BIO 1460 Current Concepts in Cell Biology 4 QH

Examines selected topics in cellular structure and function of eukaryotes, for example, their electrical and mechanical characteristics and the underlying physical and biochemical processes. Topics will vary depending upon the instructor. Lab. Lab fee. *Prereq.* BIO 1261 and physics.

BIO 1461 General Biochemistry 1 4 QH

Surveys biochemistry, emphasizing protein structure, the nature of enzymic catalysis, bioenergetics, and the metabolism of carbohydrates, lipids, and amino acids. *Prereq.* BIO 1260 and organic chemistry.

BIO 1462 General Biochemistry Laboratory 4 QH

Introduces modern research techniques used in biochemistry and molecular biology. Topics

include purification and characterization of proteins, kinetic properties of enzymes, isolation of high molecular weight DNA, recombination of DNA molecules in vitro, isolation of bacterial clones containing recombinant molecules, and in vitro mutagenesis. Covers safety and moral concerns raised by genetic engineering. Includes two hours of lecture and seven hours of lab. *Prereq.* BIO 1461.

BIO 1463 General Biochemistry 3 4 QH

Emphasizes the structure and function of organelles, mechanisms of hormonal control of metabolism, and gene regulation. *Prereq.* BIO 1461, BIO 1467.

BIO 1465 Introductory Immunology 3 QH

Covers basic consideration of the physical and chemical attributes of antigens and antibodies. Antigens of biological significance as well as in vivo antigen-antibody interactions are discussed. *Prereq.* BIO 1261.

BIO 1466 Immunology Laboratory 2 QH

Provides lab exercises dealing with immunization, quantitative antigen-antibody reactions, electrophoretic studies (agar, acrylamide gel, and cellulose acetate), immuno-fluorescence. Lab fee. *Prereq.* BIO 1465 taken concurrently.

BIO 1467 Molecular Biology 4 QH

Emphasizes experimental design and proof in macro-molecular chemistry and genetics. Studies current theories of the detailed molecular mechanisms for the preservation, expression, and evolutionary development of biological information. Applications to general biological and health problems will be emphasized. A two-hour period each week will be devoted to problem solving, research "game playing," and model building. *Prereq.* BIO 1261.

BIO 1470 Coastal Biology (Washington Coast) 4 QH

The first of a series of three courses intended to introduce the student to a wide range of coastal environments. This course includes studies of the open ocean, rocky intertidal areas, sandy beaches, and estuarine environments of the Washington coast. Basic biological principles will be demonstrated through comparative studies.

BIO 1471 Coastal Biology (Caribbean Coast) 4 QH

The second of a series of three courses intended to introduce the student to a wide range of coastal environments. This course includes studies of the open ocean, rocky intertidal areas, sandy beaches, and estuarine environments of the Caribbean. Basic biological principles will be demonstrated through comparative studies.

BIO 1472 Coastal Biology (New England Coast) 4 QH

The third of a series of three courses intended to introduce the student to a wide range of coastal environments. This course includes studies of the open ocean, rocky intertidal areas, sandy beaches, and estuarine environments of the New England

coast. Basic biological principles will be demonstrated through comparative studies.

BIO 1475 Biology and Ecology of Fish 4 QH

Examines the ecology, evolution, systematics, and behavior of fish. Uses field study, lectures, and labs. Studies specimens taken from New England waters. Lab fee. *Prereq.* Two years of college biology.

BIO 1477 The Biology of Corals 4 QH

A field, lecture, and lab course which concentrates on tropical cnidaria. The course will study the systematics, anatomy, physiology and ecology of this group of animals which assume such an important role in tropical marine ecosystems. *Prereq.* Two years of college biology.

BIO 1478 The Biology of Fish 5 QH

A field, lecture, and lab course that examines the systematics, anatomy, behavior and ecology of fish. Tropical forms are emphasized. *Prereq.* Two years of college biology.

BIO 1479 Adaptations of Aquatic Organisms 4 QH

An exploration of aquatic organisms through a study of their evolutionary responses to the aquatic habitat. The physical properties of water create physical constraints that have affected form, function, and behavior of all aquatic organisms. Density, viscosity, diffusion rates, pressure effects, and elementary fluid mechanics will be used to explain such characteristics as the

body shape of larvae, hearing and sound production, suspension feeding, and buoyancy. Course includes lectures, labs, demonstrations, and individual research projects. *Prereq.* Two years of college biology.

BIO 1480 Senior Biochemistry Seminar 1 QH

Examines recent developments in various topics of biochemistry. Emphasizes student presentation and analysis. *Prereq.* Completion of BIO 1103 through BIO 1261.

BIO 1490 Senior Seminar 1 QH

The course examines recent developments in various topics of zoology, microbiology, physiology, botany, ecology, genetics, and cell biology. Student presentation and analysis are emphasized. Limited to qualified juniors and seniors in the BA program and required of seniors in the BS program. *Prereq.* Completion of BIO 1103 through BIO 1261.

BIO 1491, BIO 1492 Directed Study 1, 2 2 QH each

Offers independent work on a chosen topic under the direction of department faculty. Limited to qualified juniors and seniors with approval of the department and special arrangements with the supervising faculty member. The two quarters of this course together count as one biology department elective. *Prereq.* Completion of BIO 1103 through BIO 1261.

Chemistry

Please note some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Office of the Dean before taking the course.

Numbers inside parentheses within course descriptions refer to core curriculum categories listed on page 3.

Introductory Chemistry Courses

CHM 1100 Special Topics in Chemistry 4 QH

Examines fundamentals and applications of chemistry of particular interest to students in business. Discusses atomic theory, chemical bonding and reactions, states of matter and common chemicals, and foundations of organic chemistry. Makes applications to plastics and polymers, chemistry, semiconductors, and nuclear power.

CHM 1110 General Chemistry Preliminaries 5 QH

Introduces general chemistry by reviewing the required computational skills, basic nomenclature, and the mole concept. *Prereq.* Permission of the course coordinator for general chemistry for the life sciences.

CHM 1111 General Chemistry for the Life Sciences 1 5 QH

Designed for nonchemistry majors. Focuses on basic concepts and definitions: the mole concept and chemical stoichiometry, states of matter, solutions, periodicity of elements, atomic structure, and chemical bonding and reactions. Lab fee. (II)

CHM 1112 General Chemistry for the Life Sciences 2A 5 QH

For students who will not be taking further chemistry. Covers chemical equilibria; acids, bases, and buffers; introduction to the organic chemistry of compounds of biological relevance; introductory biochemistry of proteins, carbohydrates, lipids, and nucleic acids. *Prereq.* CHM 1111.

CHM 1122 General Chemistry for the Life Sciences 2B 5 QH

For nonchemistry majors who will be taking CHM 1264. Subjects covered include chemical kinetics and equilibria, acids and bases, elementary thermodynamics and kinetics, and electrolysis and electrochemistry. Lab fee. (II) *Prereq.* CHM 1111.

CHM 1130 Fundamentals of Chemistry 4 QH

Focuses on applications and principles of chemistry. Examines elementary atomic theory, physical and chemical properties of matter, chemical reactions and stoichiometry, and chemical measurements with applications in engineering technology.

CHM 1131 General Chemistry for Engineering Students 1 4 QH

Primarily for engineering students. Introduces the principles of chemistry, focusing upon the states and structure of matter and chemical stoichiometry.

CHM 1132 General Chemistry for Engineering Students 2 4 QH

Primarily for engineering students. Introduces the principles of chemistry, focusing upon chemical equilibria, the nature of some common materials, and energy considerations in chemical and nuclear transformations. *Prereq.* CHM 1131.

CHM 1138 General Chemistry Laboratory 1 QH

Required for students planning to major in chemical engineering. Optional for other students taking CHM 1132. Experiments pertaining to lecture material. Lab fee.

CHM 1151 General Chemistry for Science Majors 1 5 QH

For chemistry majors and selected students in other majors, such as biology, physics, and so on. Focuses on basic concepts and definitions, moles, gas laws, stoichiometry, atomic structure, periodic properties, and chemical bonding. Lab fee.

CHM 1152 General Chemistry for Science Majors 2 5 QH

Topics include solutions, chemical kinetics, chemical equilibrium, chemical thermodynamics, electrochemistry, chemistry of the representative elements. Lab fee. *Prereq.* CHM 1141 or CHM 1151.

CHM 1153 The Chemical Elements 5 QH

For chemistry majors and selected students in other majors. Applies the principal concepts of chemistry (thermodynamics, chemical bonding, kinetics) to a systematic survey of the characteristic behavior of the chemical elements and compounds. Lab fee. *Prereq.* CHM 1122, CHM 1132, CHM 1152, or equiv.

Advanced Chemistry Courses**CHM 1221 Analytical Chemistry** 4 QH

For nonchemistry majors. Covers the principles and practice of chemical methods of analysis with

an introduction to spectrophotometry, ion selective electrodes, and gas chromatography. Discusses methods and applications for the fields of biology, clinical chemistry, toxicology, and environmental investigations. Lab fee. *Prereq.* CHM 1122 or equiv.

CHM 1231 Analytical Chemistry for Majors 5 QH

For chemistry majors. Covers the principles and practice of chemical methods of analysis with an introduction to spectrophotometry, ion selective electrodes, and gas chromatography. Examines method development, equilibrium limitations in analysis, and statistical evaluation of data as well as methods and applications for the fields of biochemistry, industrial chemistry, and chemical research. Lab fee. *Prereq.* CHM 1152 or equiv.

CHM 1264 Organic Chemistry for Biology Science Majors 1 5 QH

For nonchemistry majors. Covers nomenclature, preparation, properties, and reactions of common organic compounds. Lab fee. *Prereq.* CHM 1122, CHM 1152, or equiv.

CHM 1265 Organic Chemistry for Biology Science Majors 2 5 QH

Continues CHM 1264. Lab fee. *Prereq.* CHM 1264.

CHM 1268 Organic Chemistry for Pharmacy Majors 1 5 QH

For pharmacy majors. Covers nomenclature, preparation, properties, and reactions of common organic compounds. Lab fee. *Prereq.* CHM 1122, CHM 1152, or equiv.

CHM 1269 Organic Chemistry for Pharmacy Majors 2 5 QH

Continues CHM 1268. Lab fee. *Prereq.* CHM 1268.

CHM 1271 Organic Chemistry for Chemistry Majors and Chemical Engineering Students 1 3 QH

For chemistry majors, chemical engineering students, and selected students in other majors.

Covers synthesis and properties of aliphatic and aromatic hydrocarbons and their functional derivatives, correlation between the structure of organic compounds and their physical and chemical properties, and electronic interpretation of organic reactions. *Prereq.* CHM 1153 or CHM 1132 and CHM 1138.

CHM 1272 Organic Chemistry for Chemistry Majors and Chemical Engineering Students 2 5 QH

Continues CHM 1271. Lab fee. *Prereq.* CHM 1271.

CHM 1273 Organic Chemistry for Chemistry Majors and Chemical Engineering Students 3 5 QH

Continues CHM 1272. Lab fee. *Prereq.* CHM 1272.

CHM 1280 Physical Chemistry for the Life Sciences 1 4 QH

Examines physiochemical principles as they apply to biological processes. Covers thermodynamics, kinetics, equilibria, oxidation-reduction reactions, transport processes, quantum mechanics, and spectroscopy. *Prereq.* CHM 1122, CHM 1152, or equiv.

CHM 1281 Physical Chemistry for the Life Sciences 2 4 QH

Continues CHM 1280. *Prereq.* CHM 1280.

CHM 1381 Physical Chemistry 1 3 QH

Introduces chemical thermodynamics. Covers the three laws of thermodynamics and their applications to thermochemistry, material equilibrium, and reaction equilibrium. *Prereq.* CHM 1132, CHM 1152, or equiv.; MTH 1223, MTH 1243, or equiv.; PHY 1223, PHY 1233, or equiv.

CHM 1382 Physical Chemistry 2 3 QH

Continues chemical thermodynamics, kinetics, and transport processes. Covers theoretical concepts and practical applications of phase equilibria, quantitative use of phase diagrams, kinetic molecular theory and applications to transport processes, reaction kinetics, and mechanism. *Prereq.* CHM 1381.

CHM 1383 Physical Chemistry 3 3 QH

Presents the fundamental principles of quantum mechanics and their application to chemical problems. Emphasizes applications to atomic and molecular spectroscopy. *Prereq.* CHM 1382.

CHM 1394 Experimental Physical Chemistry 1 2 QH

Presents experiments that demonstrate simple yet accurate ways of measuring fundamental physical chemical phenomena. Examines treating experimental methodology and error analysis. Introduces computer-based data analysis. Emphasizes the preparation of concise and literate laboratory reports. Lab fee. *Prereq.* CHM 1381 or taken concurrently.

CHM 1395 Experimental Physical Chemistry 2 2 QH

Examines experiments based on various physical chemistry topics presented in CHM 1382. Explains and demonstrates computer interfacing of experimental apparatus. Focuses on data analysis using computer-based spread sheet and analysis programs. Emphasizes preparing concise and literate laboratory reports. Lab fee. *Prereq.* CHM 1382 or taken concurrently.

CHM 1396 Experimental Physical Chemistry 3 2 QH

Focuses on experiments in atomic and molecular spectroscopy and molecular photophysics that illustrate the principles discussed in CHM 1383. Emphasizes experimental methodology and preparing reports. Lab fee. *Prereq.* CHM 1383 or taken concurrently.

CHM 1422 Instrumental Methods of Analysis 4 QH

For chemistry majors and selected students in other majors. Covers principles, methods, and applications of electroanalytical chemistry, optical spectroscopy, and chromatography. Includes selected topics in instrumental design and function and in nonoptical spectroscopy. *Prereq.* CHM 1382 and CHM 1231 or permission of instructor. Chemistry majors take CHM 1432 concurrently.

CHM 1432 Instrumental Analysis Laboratory 2 QH

For chemistry majors and selected students in other majors registered for CHM 1422. Focuses on lab experiments related to topics covered in CHM 1422. Lab fee.

CHM 1441 Inorganic Chemistry 4 QH

Topics include atomic properties of free atoms and ions; ionic bonding and the structure of the solid state; the Madelung calculation; the Born-Haber and other thermodynamic cycles; valence-bond, molecular, orbital, and crystal field theories of bonding; stereochemistry of compounds of representative elements; electron-deficient compounds; and spectral and magnetic properties of transition metal compounds. *Prereq.* CHM 1383.

CHM 1451 Experimental Inorganic Chemistry 2 QH

Presents topics in modern inorganic and organometallic chemistry. Introduces important experimental techniques. *Prereq.* CHM 1441 or taken concurrently.

CHM 1461 Identification of Organic Compounds 3 QH

Examines qualitative analysis of organic compounds and mixtures, using physical, chemical, and instrumental methods. Lab fee. *Prereq.* CHM 1265 or CHM 1273.

CHM 1491, CHM 1492 Directed Study 2 QH each

Offers independent work under the direction of a faculty member. Limited to qualified students with approval of an administering committee and the supervising faculty member. *Prereq.* Completion of an organic chemistry sequence and analytical chemistry.

CHM 1521 Advanced Analytical Chemistry 1 3 QH

Examines analytical separations. Corresponds to CHM 3521. *Prereq.* CHM 1422 or equiv.

CHM 1523 Advanced Analytical Chemistry 2 3 QH

Examines the theory, practice, instrumentation, and application of selected electroanalytical methods of analysis. Corresponds to graduate course CHM 3523. *Prereq.* CHM 1422 or equiv.

CHM 1525 Advanced Analytical Chemistry 3 3 QH

Covers optical methods of analysis. Corresponds to CHM 3525. *Prereq.* CHM 1422 or equiv.

CHM 1561 Advanced Organic Chemistry 1 3 QH

Focuses on organic structure and reactions. Corresponds to graduate course CHM 3561. *Prereq.* CHM 1273 or CHM 1265.

CHM 1562 Advanced Organic Chemistry 2 3 QH

Examines organic structure and reactions. Corresponds to graduate course CHM 3562. *Prereq.* CHM 1561.

CHM 1563 Advanced Organic Chemistry 3 3 QH

Focuses on organic structure and properties. Corresponds to graduate course CHM 3563. *Prereq.* CHM 1562.

CHM 1564 Spectrophotometric Identification of Organic Compounds	3 QH	CHM 1800, CHM 1801, CHM 1802, CHM 1803, CHM 1804, CHM 1805 Undergraduate Research	4 QH each
Examines spectrophotometric identification of organic compounds. Corresponds to graduate course CHM 3564. <i>Prereq.</i> CHM 1273 or equiv.		Students may conduct original experimental work under the direction of a faculty member. A minimum of a two-quarter commitment and approval of the executive officer of the chemistry department are required. <i>Prereq.</i> at least middler year chemistry major status with a minimum QPA of 2.8 in courses required for the major.	
CHM 1581 Advanced Physical Chemistry 1	3 QH	CHM 1811 Advanced Chemical Laboratory Practice 1	4 QH
Examines chemical thermodynamics. Corresponds to graduate course CHM 3581. <i>Prereq.</i> CHM 1383.		Staff members direct lab projects in analytical, inorganic, organic, and physical chemistry. Approval of the executive officer of the chemistry department is required. Lab fee. <i>Prereq.</i> CHM 1273, CHM 1395, CHM 1396, and CHM 1422.	
CHM 1591 Advanced Physical Chemistry 2	3 QH	CHM 1812 Advanced Chemical Laboratory Practice 2	4 QH
Focuses on atomic and molecular structure. Corresponds to graduate course CHM 3591. <i>Prereq.</i> CHM 1383.		Students may continue lab projects from CHM 1811 or carry out new projects in different areas. Approval of the administrating committee is required. Lab fee. <i>Prereq.</i> CHM 1811.	
CHM 1738 General Chemistry Laboratory	1 QH	CHM 1830 Special Topics	4 QH
Honors equivalent of CHM 1138.		<i>Prereq.</i> CHM 1381 and CHM 1382.	
CHM 1741 General Chemistry 1 (Honors)	4 QH		
Honors equivalent of CHM 1131.			
CHM 1751 General Chemistry 1 (Honors)	5 QH		
Honors equivalent of CHM 1101.			
CHM 1752 General Chemistry 2 (Honors)	5 QH		
Honors equivalent of CHM 1152.			

Cinema

The following film courses are described under the different department headings. For information about the cinema studies minor, see the section on interdisciplinary minors at the beginning of the Curriculum Guide, or call the Program in Cinema Studies, 1 Boston YMCA, 617-437-5163.

Art

ART 1180 Video Basics
 ART 1233 Contemporary Directions in Photography
 ART 1235 History of Film
 ART 1236 American Film
 ART 1281 Video Project

English

ENG 1288 Film and Text
 ENG 1289 Shakespeare on Film
 ENG 1290 Topics in Film
 ENG 1291 Popular Culture
 ENG 1294 Modern Film
 ENG 1296 Topics in Film
 ENG 1297 Approaches to Film

History

HST 1494 History and Film (core course category II)
 HST 1575 History of Media in America

Interdisciplinary

INT 1320 Exploring the Humanities Through Film (core course category II)
 INT 1321 Modernism: Art, Film, and Literature

Modern Languages

LNF 1521 French Film Classics
 LNF 1550 Introductory Film Analysis

LNF 1551 Film Theory (core course category V)
 LNF 1560 Film and Psychoanalysis
 LNG 1554 Modern German Film and Literature (core course category IV)
 LNS 1550 Spanish Film Masterpieces

Music

MUS 1139 Film Music

Sociology/Anthropology

SOA 1120 Camera on Culture

Speech Communication

SPC 1450 Television 1
 SPC 1454 Programming for Radio and Television
 SPC 1455 Television 2
 SPC 1554 Special Topics in Broadcasting (when appropriate)

Theatre

DRA 1316 Acting for the Camera (See department listing for prerequisites.)

Economics

Please note some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Office of the Dean before taking the course.

Numbers inside parentheses within course descriptions refer to core curriculum categories listed on page 3.

Unless otherwise stated, there are no prerequisites for advanced economics courses. Where prerequisites are indicated, exceptions may be granted with the instructor's permission.

ECN 1115 Principles of Macroeconomics 4 QH

Introduces macroeconomic analysis. Topics include the flow of national income, economic growth and fluctuation, the role of money and banking, and monetary and fiscal policies. Emphasizes the development of conceptual tools to analyze the economic problems facing modern society. (II)

ECN 1116 Principles of Microeconomics 4 QH

Focuses on development of basic theory of demand, supply, and market price. Explores applications to selected microeconomic problems, such as basic monopoly and competition, and other issues that relate to the role of the pricing system in resource allocation and income distribution. (II)

ECN 1130 Medical Economics 4 QH

Examines health-care trends in the United States and selected foreign countries, causes of the rising costs of medical care, the particular nature of the demand for health-care services, the demand for physicians and paramedical personnel, Certificate of Need committees, health maintenance organizations, medical malpractice, increases in life expectancy and its impact on society, third-party payers, and the true cost of medical education.

ECN 1140 Economics of Crime 4 QH

Covers economic analysis of crime and the criminal justice system. Topics include theoretical and empirical analysis of the economic causes of criminal behavior, the social costs of crime and its prevention, and design of enforcement policies.

ECN 1150 Economics of World Energy and Primary Resources 4 QH

Investigates economic, political, and historical backgrounds of energy and other resources problems. Analyzes future impact of primary resources limitations on United States and world economics as well as feasibility studies of resource substitution. *Prereq.* ECN 1115 and ECN 1116.

ECN 1170 Economic Issues In Minority Communities 4 QH

Examines the economic conditions of nonwhite minorities within the United States economy. Includes historical and cultural materials as well as specific theoretical and empirical analysis of the economic problems confronting minority communities. (VI)

ECN 1215 Macroeconomic Theory 4 QH

Investigates the conceptual and empirical problems of creating and using national accounts, price index problems, conceptual and empirical evaluation of consumption and investment functions and their policy implications, multiplier and accelerator models, and recent cyclical fluctuations. Analyzes theories of inflation, unemployment and growth in the light of recent economic history. *Prereq.* ECN 1115 and MTH 1114 or equiv.

ECN 1216 Microeconomic Theory 4 QH

Examines supply-and-demand analysis, various elasticity concepts and applications, theories of demand and production, and derivation of cost curves. Analyzes pricing and output behavior in the several market structures with their welfare implications and the pricing of resources. *Prereq.* ECN 1116 and MTH 1114 or equiv.

ECN 1250 Statistics 1 4 QH

Discusses elementary set theory, basic probability, measurement and presentation of economic statistics, descriptive statistics, basic estimation techniques, testing statistical hypotheses, and sampling problems.

ECN 1251 Statistics 2 4 QH

Topics include analysis of variance, correlation and linear regression analysis, multivariate regression analysis, and Bayesian decision making. *Prereq.* ECN 1250.

ECN 1310 Labor Economics 4 QH

Focuses on economic analysis of the labor market and the labor force. Topics include the supply, development and efficient use of human resources; wage determination; the changing occupational and industrial structure; causes, nature and incidence of unemployment; the economic impact of unions, related labor market institutions and relevant public policies. *Prereq.* ECN 1116 or ECN 1115.

ECN 1311 Employment and Training Programs and Policies 4 QH

Nature and objectives of employment and training programs, nature and causes of human resource problems, current and previous efforts to solve human resource problems in the United States,

planning of human resource programs, and economic evaluation of employment and training programs. *Prereq.* ECN 1115.

ECN 1312 Women in the Labor Market 4 QH

Focuses on economic analysis of the labor market position of women in the context of the changing economic structure and labor market institutions. Analyzes female labor force participation differences; male/female differentials in earnings and unemployment; occupational concentration, occupational segregation, theories and evidence of sex discrimination; and new opportunities for women. *Prereq.* ECN 1115 and ECN 1116.

ECN 1314 Economics of Education and Human Capital 4 QH

Explores theoretical and empirical treatment of economic issues related to education and job training, including formal education (preschool through post-secondary), vocational education, on-the-job training, and government-sponsored employment and training programs. Emphasizes follow-up studies, cost-effectiveness analysis, and benefit-cost analysis for determining the effectiveness of education and training investments from a private and social standpoint. *Prereq.* ECN 1116.

ECN 1315 Income Inequalities and Discrimination 4 QH

Focuses on economic analysis of income inequalities, poverty, and discrimination. Examines the causes of income inequality and the nature, causes and effects of poverty; economics of racial discrimination; and public welfare system and other income maintenance schemes. *Prereq.* ECN 1115 or ECN 1116.

ECN 1320 Urban Economics 4 QH

Studies urban growth and development, intermetropolitan location of business firms, regional shifts in economic activity, intrametropolitan location of firms and households, and land use patterns. *Prereq.* ECN 1116.

ECN 1321 Urban Economic Problems and Policies 4 QH

Focuses on economic analysis of selected urban problems such as housing, poverty, transportation, education, health, crime, and the urban environment. Discusses public policies relating to such problems. *Prereq.* ECN 1116. *Sequel to* ECN 1320. (ECN 1320 not a prereq.)

ECN 1322 Economics of Transportation 4 QH

Covers transportation and land-use patterns; externalities; social costs and social benefits of various modes of transportation, ownership, regulations, and financing of various modes of transportation; and economics of new technology in transportation. *Prereq.* ECN 1116.

ECN 1323 Environmental Economics 4 QH

Applies the tools of economics to environmental issues. Explores taxonomy of environmental effects; externalities; the commons problem; taxation, regulations, marketable permits, and property rights as a solution; measuring benefits of cleaner air and water, noise abatement, and

recreational areas; global issues including tropical deforestation and acid rain; the relevance of economics to the environmental debate. *Prereq.* ECN 1116.

ECN 1330 Development Economics 4 QH

Explores prospects for economic growth and development in poor nations as indicated by economic analysis and historical experience; social, cultural, and institutional determinants of growth; analysis of agriculture and development, the role of technological change, population; and foreign trade. (V)

ECN 1331 American Economic Development 4 QH

Studies economic development of the United States from the colonial period to the present, historical changes in economic institutions and technologies, with special attention to preconditions of industrialism; the American Industrial Revolution, its spread and socioeconomic consequences; the Great Depression and the subsequent rise of mixed economy and welfare state; and United States adjustments to postwar economic changes.

ECN 1332 Economic History of Less Developed Countries 4 QH

Considers the problems of initiating and sustaining economic development in selected Third World countries during the last two hundred years. Country-specific case studies cover the role of traditional economic structures, different development goals and strategies, state policies, and international economic relations. *Prereq.* ECN 1115; ECN 1116; ECN 1330 recom.

ECN 1333 European Economic Development 4 QH

Discusses economic inheritance of the nineteenth century development of capitalism and laissez-faire; the aftermath of the Industrial Revolution, European overseas expansion, the world wars, and the dissolution of empires; American economic conquest and European integration; the future of less developed areas in southern Europe; environmental impact of industrialism and the implications of technological society. (III)

ECN 1334 Comparative Economics 4 QH

Emphasizes competing types of theoretical economic systems; analysis of organization and operation of currently existing types of communist, socialist, and capitalist economies; comparison and evaluation of economic behavior and performance of different economic systems. *Prereq.* ECN 1115 and ECN 1116.

ECN 1335 International Economics: Finance 4 QH

Introduces the workings of foreign exchange markets, balance of payments, fiscal and monetary policy in an open economy under different exchange rate regimes, international capital movements, and the international monetary system. *Prereq.* ECN 1115 or permission of instructor.

- ECN 1336 International Economics: Trade** 4 QH
Examines trade theories and patterns, impact of trade on domestic factor prices, factor movements, and terms of trade. Explores welfare implications and political economy of alternative trade policies, such as free trade, tariffs, quotas, and custom unions. *Prereq.* ECN 1116 or permission of instructor.
- ECN 1337 History of Economic Thought** 4 QH
Traces the evolution of Western economic thought. Covers several important schools in economics, examining the questions economists raise and analytical methods they use to study human behavior. *Prereq.* ECN 1115 and ECN 1116.
- ECN 1340 Government Expenditures: Structure and Evaluation** 4 QH
Covers fiscal functions of government, fiscal institutions and politics, theory of social goods, public expenditure growth and structure, federal budget expenditure evaluation and cost-benefit case studies, fiscal federalism in theory and practice, and issues of public debt and deficit. *Prereq.* ECN 1116 or equiv.
- ECN 1341 Financing of Government: Taxation and Debt** 4 QH
Considers principles of taxation; problems of tax structure and reform at federal, state, and local levels; tax incidence; effects of taxation on economic efficiency and growth; negative income tax and social security finance; issues of public debt and deficit. *Prereq.* ECN 1116 or equiv.
- ECN 1342 Money and Banking** 4 QH
Studies the nature and the functions of money, credit, and the role of financial organizations in the United States economy. Emphasizes theories of banking, money supply, and monetary policy. *Prereq.* ECN 1115 or equiv.
- ECN 1345 Business Cycles and Inflation** 4 QH
Considers the theories of business cycles and inflation and an empirical application of these theories to current business cycle, inflation, and stagflation problems. *Prereq.* ECN 1115, ECN 1116, and ECN 1215.
- ECN 1350 Introduction to Econometrics** 4 QH
Presents an introduction to the methods of econometric analysis and forecasting. Covers ordinary least squares, piecewise regression, tests and corrections for serial correlation and heteroskedasticity, specification analysis, simultaneous equations systems, errors in variables, dynamic models and elementary forecasting. *Prereq.* ECN 1115, ECN 1116, and ECN 1251.
- ECN 1351 Problems in Economic Research** 4 QH
Examines research methods used by practicing economists. Discusses typical problems from applied areas of economics, including choice of modeling framework, problems of data collection, review of estimation techniques, interpretation of

results, and development of static and dynamic adaptive policy models. *Prereq.* ECN 1115, ECN 1116, ECN 1251.

- ECN 1353 Introduction to Mathematics for Economists** 4 QH
Introduces basic tools of mathematics, matrix algebra, differential and integral calculus and classical optimization, with special reference to economic applications. *Prereq.* ECN 1115; ECN 1116.
- ECN 1360 Managerial Economics** 4 QH
Explores the application of economic principles and theory, by the use of case studies, to the solution of decision-making problems in such areas as demand forecasting, price policies, estimation and control of costs, financing of capital investments, and responses to government taxation and regulation policies. *Prereq.* ECN 1116.
- ECN 1362 Industrial Organization and Public Policy** 4 QH
Presents an analytic framework and empirical study of how the structure of industrial organization and conduct of sellers and buyers affects economic performance and welfare. Includes industrial examples and case studies. Examines antitrust as a public policy designed to promote better market performances. *Prereq.* ECN 1116.
- ECN 1401 Advanced Economic Theory** 4 QH
Covers advanced theoretical treatment of selected topics in micro- and macroeconomics. Recommended for students planning to take graduate economics. *Prereq.* ECN 1215 and ECN 1216.
- ECN 1415 Selected Topics in Macroeconomics** 4 QH
Studies macroeconomic issues. *Prereq.* Permission of instructor.
- ECN 1416 Selected Topics in Microeconomics** 4 QH
Studies microeconomic issues. *Prereq.* Permission of instructor.
- ECN 1481 Directed Study** 1 QH
Offers independent work on a chosen topic under the direction of a faculty member of the department. Should not be substituted for the course requirements leading to a BA or BS degree in economics. Up to four quarter hours per offering, with an eight quarter-hour maximum. *Prereq.* Qualified senior economics majors and approval of department chair.
- ECN 1482 Directed Study** 2 QH
Offers independent work on a chosen topic under the direction of a faculty member of the department. Should not be substituted for the course requirements leading to a BA or BS degree in economics. Up to four quarter hours per offering, with an eight quarter-hour maximum. *Prereq.* Qualified senior economics majors and approval of department chair.

ECN 1483 Directed Study 3 QH

Offers independent work on a chosen topic under the direction of a faculty member of the department. Should not be substituted for the course requirements leading to a BA or BS degree in economics. Up to four quarter hours per offering, with an eight quarter-hour maximum. *Prereq.* *Qualified senior economics majors and approval of department chair.*

ECN 1484 Directed Study 4 QH

Offers independent work on a chosen topic under the direction of a faculty member of the department. Should not be substituted for the course requirements leading to a BA or BS degree in economics. Up to four quarter hours per offering,

with an eight quarter-hour maximum. *Prereq.* *Qualified senior economics majors and approval of department chair.*

ECN 1492 Senior Economics Seminar 4 QH

Coordinates and applies economic concepts, methodology, and data to issues and problems of broad social, economic, and philosophical importance. *Prereq.* *ECN 1216 and ECN 1215; senior economics majors only.*

ECN 1715 Macroeconomics Principles (Honors) 4 QH

Honors equivalent of ECN 1115.

ECN 1716 Microeconomics Principles (Honors) 4 QH

Honors equivalent of ECN 1116.

English

Please note some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Office of the Dean before taking the course.

Numbers inside parentheses within course descriptions refer to core curriculum categories listed on page 3.

Unless otherwise indicated, the prerequisite for upperclass courses is a freshman English sequence. For students in the Basic Colleges this means ENG 1110 and ENG 1111; ENG 1013, ENG 1014, and ENG 1111; ENG 1110, ENG 1014, and ENG 1111. For the College of Engineering, ENG 1111 and ENG 1113. For School of Engineering Technology, ENG 1110, ENG 1111, and ENG 1114; ENG 1110, ENG 1014, ENG 1111, and ENG 1114; or ENG 1013, ENG 1014, ENG 1111, and ENG 1114. And for international students, ENG 1005 and ENG 1006.

ENG 1001 Intensive English as a Second Language 0 QH

Reviews English grammar to help non-native speakers to develop listening, speaking, reading, writing, and studying skills. Includes language lab and small-group tutorials.

ENG 1004 Fundamentals of English for Non-Native Speakers 4 QH

Provides intensive practice in composition with accent on accurate, intelligible writing and paragraphs organized around single, well-supported ideas. Encourages sentence-combining and vocabulary development, and gives special attention to individual writing needs. Includes prose readings, class discussion, and selective review of grammar. *Prereq.* *Special placement for non-native speakers whose performance or scores indicate that their writing skills are not yet up to those required for ENG 1005.*

ENG 1005 English for International Students 1 4 QH

Emphasizes the development of skills needed in writing clear, expository prose essays. Requires the regular writing and rewriting of essays of increasing length and complexity. Focuses on appropriate prose readings for discussion and analysis and introduces techniques preparatory to research writing. *Prereq.* *ENG 1004 or special placement.*

ENG 1006 English for International Students 2 4 QH

Introduces the study of literature through close reading and discussion of fiction, nonfiction, and poetry. Advances development of rhetorical techniques by requiring frequent essays written in relation to the readings and rewritten to improve content, organization, and diction. Provides guided experience with using outside sources and library materials for writing a term paper. *Prereq.* *ENG 1005 or equiv.*

ENG 1013 Fundamentals of English 1 4 QH

Offers an introduction to principles of the writing process. Emphasizes individualized assistance in generating and developing ideas, drafting, revising, and organizing and mastering the conventions of written English. *Prereq.* *Special placement.*

ENG 1014 Fundamentals of English 2 4 QH

Continues instruction in writing, emphasizing exposition, argument, and academic essay writing, as well as the conventions of English usage, punctuation, and syntax. Individualized assistance in invention, drafting, revision, and editing. *Prereq.* *ENG 1013 or ENG 1110.*

ENG 1110 Freshman English 1**4 QH**

Focuses on the individual student's writing skills. Includes application of important principles of composing, logic, and rhetoric to exposition and argumentation. Reviews sentence structure, punctuation, and paragraphing. Analyzes essay forms and problems. Students receiving a grade of S must take ENG 1014.

ENG 1111 Freshman English 2**4 QH**

Continues instruction in writing, with emphasis on expository methods of defining, describing, analyzing, persuading, and composing the research paper. Students write lengthy critical essays based on consideration of primary and secondary materials. Selections of poems, stories, and plays provide an introduction to literature and are the subject matter for discussion of writing technique and written assignments. ENG 1111 follows ENG 1110 and is required of all freshmen in the University. *Prereq.* ENG 1110 or ENG 1014.

ENG 1113 Great Themes in Literature**4 QH**

Explores a theme in literature through a number of illustrative works from the past and the present. Develops techniques of research and documentation.

ENG 1115 Poetry**4 QH**

Involves close reading of selected poems, study of critical terms, and practice in different critical approaches to poetry; examines techniques for reading a variety of poetic texts. (II)

ENG 1116 Fiction**4 QH**

Involves close reading of selected novels and short stories, study of critical terms, and practice in different critical approaches to fiction. (II)

ENG 1117 Drama**4 QH**

Involves close reading of selected plays, study of critical terms, and practice in different critical approaches to drama. (II)

ENG 1118 Introduction to Language and Linguistics**4 QH**

Introduces students to a new way of thinking about language. Normally, using language is as unconscious an activity as walking or chewing gum. But if we ask the right questions, we can uncover much of our unconscious linguistic knowledge: about sentence structure (syntax), meaning (semantics), word forms (morphology), and speech sounds (phonology). Understanding these will lead us to examine other issues related to language: the Black English/Standard English debate, women's and men's language, "talking" chimpanzees, "talking" computers, and the nature/nurture controversy. (II)

ENG 1119 History of the English Language**4 QH**

Studies the development of modern English from Anglo-Saxon beginnings; effects of Scandinavian and Norman invasions; dialect geography; evolutionary changes, word formation, and

borrowing; and origins of writing and problems of spelling. Readings include both formal and informal writings, literary selections, wills, journals, and private and public letters. (III)

ENG 1120 Survey of English Literature 1**4 QH**

Surveys the major British writers and major literary forms and works from the Middle Ages to the end of the eighteenth century. Includes works by such writers as Chaucer, Spenser, Shakespeare, Milton, Pope, and Swift.

ENG 1121 Survey of English Literature 2**4 QH**

Surveys the major British writers and major literary movements from the romantic period through the Victorian and modern periods to the present. Includes works by such writers as Wordsworth, Coleridge, Keats, Browning, Tennyson, Yeats, Lawrence, Lessing, and Beckett.

ENG 1123 Survey of American Literature 1**4 QH**

Surveys the major American writers and major literary forms and works from the colonial period to the Civil War. Includes works by such writers as Bradstreet, Taylor, Cooper, Poe, Hawthorne, Melville, and Emerson.

ENG 1124 Survey of American Literature 2**4 QH**

Surveys the major American writers and major literary forms and works from the Civil War to the mid-twentieth century. Includes works by such writers as Whitman, Dickinson, Twain, James, Hemingway, Fitzgerald, Faulkner, and Wright.

ENG 1125 Technical Writing 1**4 QH**

Trains writers in the clear, unambiguous style of technical writing. Students practice these skills by writing technical proposals, process descriptions, feasibility and program reports, and operators' manuals. Includes oral presentations. Lab fee.

ENG 1126 Backgrounds in English and American Literature**4 QH**

Examines translation of Greek, Roman, and biblical literature as background for literary study. Emphasizes the development of myth, genre, and theme. Readings include Homer, Virgil, Ovid, the most influential parts of the Bible, and Dante. (III)

ENG 1275 Grammar for Journalists**4 QH**

Reviews the mechanics of newspaper and magazine prose. Emphasizes grammatical forms, punctuation, spelling, effective structures, and conventional usage. *Prereq.* Journalism majors only.

ENG 1276 Science Fiction**4 QH**

Traces the development of various SF themes and approaches, from early man/machine love/hate relationships to alien close encounters of all kinds. From *Frankenstein* to most recent titles. Lab fee.

ENG 1277 Topics in Science Fiction 4 QH

Focuses on a single writer or group of writers (Wells or writers of contemporary American science fiction), a theme (women in science fiction or the future city), or a unifying idea (time travel or utopia/dystopia).

ENG 1278 Modern Bestseller 4 QH

Explores the function of quest, romance, and adventure in a selection of contemporary bestselling fiction.

ENG 1279 The Modern Novel 4 QH

Studies the major British and American novelists of the twentieth century. Considers theme and form in such authors as Lawrence, Woolf, Fitzgerald, Ellison, Doctorow, and Didion. (III)

ENG 1280 Modern Drama 4 QH

Studies the development of drama from realism to surrealism, from Ibsen to Beckett.

ENG 1281 The Modern Short Story 4 QH

Studies the short story from Poe to the present, including such writers as Joyce and Kafka, Hemingway and Flannery O'Connor.

ENG 1283 Contemporary Fiction 4 QH

Examines British and American writers from 1945 to the present, including such figures as Lessing, Burgess, Pynchon, and Barth. Emphasizes experimental and modernist authors.

ENG 1285 Literature and the Law 4 QH

Investigates the problems of crime and justice as reflected in literature, from ancient to contemporary works. The secondary focus is the law itself as literature, including explorations of case files and other legal material. The readings encourage students to discover the changing nature of the criminals—heroes or victims or villains—and to deal with the social, psychological, and political facts that define them.

ENG 1286 Literature and Politics 4 QH

Students explore how authors from Sophocles to Mailer represent the religious, moral, and ethical conflicts arising from the acquisition, use, and misuse of political power. The literature falls into several categories: utopian, which establishes a conflict between the ideal and the real; satirical, which threatens a power structure by exposing it to scorn; analytic, which describes the rise to and fall from power of individuals, parties, or states; and investigative, which takes the reader inside a power elite to observe its inner operations. Participants examine the difference between the ideal of government and its reality.

ENG 1287 The Literature of Science 4 QH

Examines historically the discovery methods and models of literature and science, exploring one or more of the following areas: the relationship of the methods and models of literature and science; the

treatment of scientific methods and models in literature; the use of literary devices, techniques, and traditions in scientific texts. Readings will be drawn from historically significant scientific texts, literary texts, or some combination of these. (VI)

ENG 1288 Film and Text 4 QH

Studies either the similarities and differences between literary texts and film versions of those texts or the interrelations between film and literature as means of cultural expression during a specific historical period. For example, students might compare Doctorow's *Book of Daniel* to the film version, *Daniel*, or they might study books and movies of a period like the sixties that reflect the spirit of the era (*Catch-22*, *The Graduate*). Lab fee.

ENG 1289 Shakespeare on Film 4 QH

Examines the various treatments of Shakespeare's plays on film. Treats the technical aspects of film and how these are used by directors to transfer Shakespeare's plays from the stage to the screen. Lab fee.

ENG 1290 Topics in Film 4 QH

Studies a theme or problem (film and society, film and politics), a period in film history (American film from 1945 to the present), a film genre (the western, film noire), or a film director (Hitchcock, Coppola). Lab fee.

ENG 1293 Topics in Popular Culture 4 QH

Focuses on such topics as the soap opera, the western, and the police story; on a popular culture activity; or on a popular culture perspective.

ENG 1294 Modern Film 4 QH

A selection of major modern films from around the world will be studied from a thematic, cultural, and historical perspective. Special attention is given to political, social, ethical, and psychological issues, as well as to the way common human themes emerge in quite diverse cultures. The course also covers the basic procedures of film interpretation. Lab fee.

ENG 1300 Topics in Fiction 4 QH

Studies a particular kind of fiction, such as the novella; a problem in fiction, such as the role of the narrator; a particular group of fiction writers; or a theme in fiction.

ENG 1307 Approaches to Literature 4 QH

Examines ancient and modern theories of literature. Includes selections from the criticism of Plato, Aristotle and the Romantics, as well as from Marxist, Freudian, Jungian, and formalist theories.

ENG 1309 Topics in Literary Criticism 4 QH

Studies a specific problem method or school of criticism, such as structuralism or archetypal criticism.

ENG 1340 Writing Workshop**1 QH**

Students will write one long paper, often in conjunction with an assigned paper in another course, that will be produced in a class booklet at the end of the quarter. The course emphasizes the writing process: multiple drafts, revision, editing, and publication. *Prereq.* *Engineering student with at least 80 QH or permission of Middler Year Writing Office, 433 Holmes, 617-437-3964.*

ENG 1350 Intermediate Writing**4 QH**

Provides writing instruction in an interdisciplinary course in which students develop papers on topics relating to their majors. Led by English faculty, students will also read and respond to essays from various disciplines. Writing will be guided in stages from proposal through finished product. Lab fee.

ENG 1351 Creative Writing**4 QH**

Gives the developing writer an opportunity to practice writing various forms of both poetry and prose. Features in-class discussion of student work.

ENG 1352 Advanced Writing**4 QH**

Offers an opportunity for experienced writers to hone their skills and develop their interests in different forms and subjects. *Prereq.* *ENG 1350 or permission of instructor.*

ENG 1357 Poetry Workshop**4 QH**

Advanced workshop in writing and examining original student poetry. Students experiment in established poetic forms and compose their own work. *Prereq.* *ENG 1351 or permission of instructor.*

ENG 1360 Topics in Writing: Reading and Writing Nonfiction**4 QH**

Combines literary analysis and creative writing. Concentrates on subjects of twentieth-century nonfiction prose such as politics, science, "culture," athletics, and natural history. Considers authors such as Elizabeth Drew, Russell Baker, and Stephen Jay Gould.

ENG 1361 The Writing Process**4 QH**

Explores writing in theory and practice. Students observe writers at work and tutor students in the Writing Center as part of the course work.

ENG 1362 Publication Arts**4 QH**

Acquaints students with basic publishing skills. Each student chooses an area of specialization, such as fiction, medicine, law, or engineering, in order to develop skill in editing manuscripts.

ENG 1370 Technical Writing 2**4 QH**

Offers an opportunity for students to develop technical writing skills in a particular subject or form. *Prereq.* *ENG 1125 or permission of instructor.*

ENG 1371 Writing for the Computer Industry**4 QH**

Focuses on computer documentation, covering general information and operating and programming instructions. Includes graphics, layout,

testing, and revision. *Prereq.* *ENG 1125 or permission of instructor and one computer science course.*

ENG 1381 Writing for the Professions: Business Administration**4 QH**

Allows students to gain professional writing experience similar to that of the workplace. Relies on the process approach to writing and features an extended simulation, which integrates common written and oral communication through practical application. Lab fee.

ENG 1382 Writing for the Professions: Criminal Justice**4 QH**

Provides students in the College of Criminal Justice with instruction in writing a variety of professional forms.

ENG 1400 Topics in Genre**4 QH**

Explores the characteristics of a particular literary form over time through works by various authors.

ENG 1401 Introduction to Syntax**4 QH**

Offers an introduction to syntax, the structural rules of a language. Develops and tests syntactic theory which, like other scientific theories, seeks to explain why things are the way they are. The question underlying the investigation is: how do the structures of language relate to the structure of the human mind? (V)

ENG 1402 Grammars of English**4 QH**

Provides a study of the rules of sentence construction in English, contrasting the traditional framework with current linguistic models. Students will have the opportunity to prepose, postpose, and extrapose as they learn to manipulate grammatical constructs.

ENG 1407 Introduction to Semantics**4 QH**

Focuses on meaning and how it is expressed in language—through words, sentence structure, intonation, stress patterns, and speech acts. How do content, logic, and speakers' and listeners' assumptions affect what sentences can mean? In what ways is linguistic meaning determined by our perceptual system or our culture?

ENG 1408 Topics in Linguistics**4 QH**

Examines closely one of a range of topics from the perspective of current linguistics: American dialects, language and law, women's and men's language, words and word structures, or issues in linguistics and literature.

ENG 1409 American Novels 1**4 QH**

Focuses on the themes, forms, and techniques of major American novelists of the nineteenth and early twentieth centuries, such as Cooper, Hawthorne, Melville, Twain, and James.

ENG 1410 American Novels 2**4 QH**

Studies the modern and contemporary American novel. Considers such writers as Cather, Hemingway, Fitzgerald, Faulkner, Bellow, and Baldwin. (III)

- ENG 1411 English Drama 1** 4 QH
 Surveys representative English drama, excluding Shakespeare, from *Everyman* to Goldsmith and Sheridan. Analyzes dramatic forms as well as the role of the Elizabethan theaters, dramatic conventions, audience content, and acting styles in Restoration farces.
- ENG 1412 English Drama 2** 4 QH
 Surveys representative English drama of the nineteenth and twentieth centuries. Charts the development of the genre from the nineteenth century to the present and discusses themes and forms.
- ENG 1550 Psychology and the Novel** 4 QH
 Concentrates on twentieth-century novels and short stories that stress individual behavior and motivation and reveal human mental and emotional processes. Includes such writers as Kafka, Dostoevski, Faulkner, Conrad, and Lawrence.
- ENG 1551 Gender Roles in Literature** 4 QH
 Investigates the relation between sex roles and literary portrayals. Selections represent male and female writers and provide a culturally comparative perspective.
- ENG 1552 Fantasy** 4 QH
 Studies the theory and practice of fantasy as found in the works of such writers as Swift, Carroll, C.S. Lewis, Orwell, and Tolkien.
- ENG 1557 Topics in Fantasy** 4 QH
 Explores such areas as dreams, nightmares, and borderline states of consciousness in the works of such writers as Poe and Kafka.
- ENG 1558 Literature in Context** 4 QH
 Attempts to place the writer in the context of a special theme. For example, students might discuss a group of authors influenced by their common interest in psychoanalysis, by their social consciousness, or by an interest in the Wild West and the settlement of America.
- ENG 1559 Literature in Context** 4 QH
 Similar to ENG 1558 but with different texts and contexts.
- ENG 1600 Topics in Literature** 4 QH
 Experiments with subjects and themes such as the censored novel, the Holocaust, alienation, and popular song lyrics.
- ENG 1601 Topics in Literature** 4 QH
 Same as ENG 1600 but with different topics.
- ENG 1602 Major Figure** 4 QH
 Examines in detail the work of one writer such as Mark Twain, Virginia Woolf, or Eugene O'Neill.
- ENG 1607 Major Figure** 4 QH
 Same as ENG 1602, but concentrating on the work of a different writer.
- ENG 1608 The City in Literature** 4 QH
 Examines the city in literature as it has been depicted from ancient times to the present, from Plato to Barthelme. Discusses such themes as the city as a locus of evil, the city as a place of possibility, and the city as a center of art and an influence on creative form in an interdisciplinary fashion.
- ENG 1609 Contemporary American Literature** 4 QH
 Studies major movements in American poetry and fiction since 1945. Considers such poets as Plath, Ginsberg, and Ashbery, and such novelists as Morrison, Pynchon, and Vonnegut.
- ENG 1610 Early American Literature** 4 QH
 Examines American literature of the colonial and federal periods, including Bradford, Taylor, Edwards, Franklin, Wheatley, Irving, and Bryant.
- ENG 1611 New England Renaissance** 4 QH
 Studies the development of a native tradition in the context of democratic and romantic attitudes toward experience and the paradox these attitudes reveal. Includes such writers as Emerson and Thoreau, Hawthorne, and Melville.
- ENG 1612 American Realism** 4 QH
 Examines the realistic tradition in American literature, including local color and native humor, from the end of the Civil War to the turn of the century. Includes such writers as Twain, James, Howells, Crane, and Norris.
- ENG 1617 Modern American Literature** 4 QH
 Studies major developments in American poetry and fiction from 1900 to 1945. Considers such poets as Frost, Eliot, Stevens, and Moore, and such novelists as Hemingway, Faulkner, Fitzgerald, and Porter.
- ENG 1618 Children's Literature** 4 QH
 Studies the history of children's literature in the English language, with special attention to matters such as genre theory and critical approaches. Includes such works as *Alice in Wonderland*, *Uncle Remus*, *Little Women*, and *The Wizard of Oz*.
- ENG 1619 Topics in Children's Literature** 4 QH
 Focuses closely either on a specific collection of stories (*Grimm's Fairy Tales*), on a specific genre (boys' books), on a problem of evil, or on children's literature as a form of group socialization.
- ENG 1621 Nineteenth-Century British Fiction** 4 QH
 Studies theme and form in the major English novels of the nineteenth century, considering such authors as the Brontës, Charles Dickens, George Eliot, and Thomas Hardy.
- ENG 1622 Major Twentieth-Century British Novelists** 4 QH
 Introduces students to British fiction from Joseph Conrad to John Fowles, including such writers as D.H. Lawrence, Virginia Woolf, and others less well known. The aim of the course is to show how

novels as artistic creations shape their own worlds while helping us to understand ourselves.

ENG 1627 Medieval English Literature 4 QH

Surveys the major works of medieval English literature. Includes works such as *Sir Gawain*, *Piers Plowman*, and *Pearl*.

ENG 1628 Chaucer 4 QH

Surveys the work of Chaucer, with particular emphasis on the *Canterbury Tales*.

ENG 1629 Topics in Chaucer 4 QH

Examines closely a particular work or group of works (such as *Troilus and Criseyde*) or a theme (such as Chaucer's symbolism).

ENG 1630 Milton 4 QH

Concentrates on Milton's *Paradise Lost*, with supplementary readings in his minor poetry and prose.

ENG 1631 Topics in Medieval Literature 4 QH

Focuses on such topics as a genre (romance or debate literature) or on a theme (alchemy or King Arthur).

ENG 1632 Sixteenth-Century Literature 4 QH

Concentrates on sonnets, love lyrics, and erotic narrative poetry, principally by Wyatt, Sidney, Marlowe, Spenser, and Shakespeare.

ENG 1637 Seventeenth-Century English Literature 4 QH

Examines major writers of the period, such as Bacon and Jonson, Donne and Herbert, Milton and Dryden.

ENG 1639 Eighteenth-Century English Literature 4 QH

Surveys the Augustan age of comic masterpieces. Includes such major writers as Pope, Addison, Steele, Swift, Goldsmith, Burns, Johnson, and Boswell.

ENG 1640 Topics in Eighteenth-Century Literature 4 QH

Examines closely such topics as a single writer or group of writers (Fielding or the essayists), a genre (satire), or a theme (reason and madness).

ENG 1641 Romantic Poetry 4 QH

Surveys the development of English Romantic poetry, both in its lyric and longer forms, in Blake, Wordsworth, Coleridge, Byron, Shelley, and Keats. Emphasizes problems of belief and the relationship of the individual to the surrounding world of natural, social, and historical process. (V)

ENG 1647 Victorian Literature 4 QH

Surveys the major issues and writers of Victorian England, considering such writers as Tennyson and Browning, Dickens and the Brontës, G.M. Hopkins and Oscar Wilde.

ENG 1648 Topics in Victorian Literature 4 QH

Examines closely a single writer or group of writers (Arnold or the fantasists) or a theme (the movement toward modernism or decadence).

ENG 1649 World Literature 1 4 QH

Surveys world literature from the time of the Greeks through the Renaissance, from Homer to Cervantes.

ENG 1650 World Literature 2 4 QH

Surveys world literature from the Renaissance through the modern period, from Voltaire to Brecht.

ENG 1652 Twentieth-Century English Literature 4 QH

Surveys the best and most interesting work of twentieth-century British writers such as William Butler Yeats, D.H. Lawrence, W.H. Auden, Doris Lessing, and Iris Murdoch.

ENG 1658 Introduction to Shakespeare 4 QH

Covers a selection of the major plays of Shakespeare, including both tragedies and comedies. (III)

ENG 1659 Shakespeare's Comedies 4 QH

Studies the romantic comedies, problem comedies, and romances, ranging from *The Merchant of Venice* to *The Tempest*.

ENG 1660 Shakespeare's Tragedies 4 QH

Studies the nature of the tragic hero, the questioning of social norms, and the landscape of chaos, ranging from *Julius Caesar* to *Coriolanus*.

ENG 1661 Topics in Shakespeare 4 QH

Examines closely such topics as the history plays, Shakespeare in performance, the Shakespearean hero, and psychological approaches to Shakespeare.

ENG 1662 The Bible 4 QH

Studies books of both the Old Testament and the New Testament as literature and as history.

ENG 1667 Modern Poetry 4 QH

Studies the modernist tradition in American and British poetry. Considers such writers as Yeats, Hardy, Frost, Eliot, Stevens, Pound, Williams, and Cummings. (III)

ENG 1677 Contemporary Poetry 4 QH

Studies developments in British and American poetry since 1945. Includes such writers as Plath, Ginsberg, Lowell, Bly, Ashbery, and Heaney. (VI)

ENG 1678 Early African-American Literature 4 QH

Surveys the development and range of black American writers, emphasizing poetry and prose from early colonial times to the Civil War.

ENG 1679 Modern African-American Literature 4 QH

Surveys the development and range of black American writers, emphasizing poetry and prose from the post-Civil War period to the present.

ENG 1690, ENG 1691 Junior/Senior Seminar 4 QH

(First preference given to students needing the course to complete the major.) Explores an important aspect of literature such as the writer and the audience, the tradition of the new, style

and meaning, and the jazz age. Emphasizes independent research in a seminar setting.

ENG 1710 Freshman English 1 (Honors) 4 QH
Honors equivalent of ENG 1110.

ENG 1711 Freshman English 2 (Honors) 4 QH
Honors equivalent of ENG 1111.

ENG 1713 Great Themes in Literature (Honors) 4 QH
Honors equivalent of ENG 1113.

ENG 1721 Survey of English Literature 2 (Honors) 4 QH
Honors equivalent of ENG 1121.

ENG 1723 Survey of American Literature 1 (Honors) 4 QH
Honors equivalent of ENG 1123.

ENG 1725 Technical Writing (Honors) 4 QH
Honors equivalent of ENG 1125.

ENG 1750 Intermediate Writing (Honors) 4 QH
Honors equivalent of ENG 1350.

ENG 1758 Introduction to Shakespeare (Honors) 4 QH
Honors equivalent of ENG 1658.

ENG 1781 Writing for Business (Honors) 4 QH
Honors equivalent of ENG 1381.

ENG 1810, ENG 1811 Directed Study 4 QH each

Geology

Please note some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Office of the Dean before taking the course.

Numbers inside parentheses within course descriptions refer to core curriculum categories listed on page 3.

GEO 1119 Marine Resources 4 QH
Provides a qualitative and quantitative survey of renewable and nonrenewable resources from the sea. Aspects covered include offshore oil and gas utilization, marine minerals, tidal power, and coastal zone recreational resources, including polluted beaches and artificial fishing reefs.

GEO 1120 Physical Oceanography 4 QH
Provides a description of the physical properties and composition of sea water, waves, tides, and ocean currents. Discusses how these properties are measured by oceanographers and how they influence the earth's environment and climate.

GEO 1121 Biological Oceanography 4 QH
Topics include the productivity of animal and plant life in the various zones of the ocean and the growing economic importance of the oceans as a source of food for the expanding world population.

GEO 1122 New England Fishery Resources 4 QH
Provides an overview of the fisheries industry of New England. Emphasizes environmental factors controlling the distribution, quality, and abundance of fisheries resources. Discusses the methods and the effects of direct human utilization of the resource as well as the indirect effects of pollution and habitat modification.

GEO 1128 Geological Oceanography 4 QH
Examines the relationship between the form of the ocean basins and their margins and the major processes forming them. Emphasizes local

landforms, including New England beaches, spits, barrier islands, and the continental shelf. (II)

GEO 1140 Environmental Geology 4 QH
Discusses how geologic processes acting at the Earth's surface interact with the human environment. Topics include river and ocean flooding, coastal erosion, landslides, land-use planning, and waste disposal.

GEO 1141 Geological Hazards and Resources 4 QH
Discusses how geologic processes originating deep inside the Earth interact with the human environment. Topics include global crystal movements, volcanic and earthquake hazards, mineral resources, coal and oil, geothermal energy, resource management, and disposal of radioactive wastes. (II)

GEO 1154 Planetary Astronomy 4 QH
Focuses on astronomy of the solar system. Topics include description of the planets and other objects, with discussion of how our understanding has evolved from the days of naked-eye observation to the present era of interplanetary probes. (V)

GEO 1208 Age of Dinosaurs 4 QH
Focuses on major physical and biological events of the Mesozoic Era of earth history. Draws on evidence from the sedimentary rock record to provide a basis for interpretations of Mesozoic life, climates, mountain building, and paleogeography.

Demonstrates principles of evolution and extinction through dinosaur paleobiology and history.

GEO 1210 North America and the Ice Age 4 QH

Focuses on description and history of ice sheets that have advanced and retreated across the northern United States and Canada during the last three million years. Topics include evidence of past climatic change and predictions of future change, fluctuating sea levels, and the impact of these changes on humans and the environment.

GEO 1212 Physical Geology 4 QH

Offers a systematic study of the materials comprising the Earth. Emphasizes the processes that form, transport, alter, and destroy rock, as well as the nature and development of landscape. (II)

GEO 1213 Physical Geology Laboratory 1 QH

Optional lab for GEO 1212. Exercises pertain to mineral and rock identification and topographic and geologic map interpretation. Required for geology majors. *Prereq. GEO 1212; may be taken concurrently.*

GEO 1222 Historical Geology 4 QH

Traces the physical and biological history of the earth through geologic time. Major topics are the origin and evolution of life, mountain building, and continental drift. (II)

GEO 1223 Historical Geology Laboratory 1 QH

Studies fossil representatives of major invertebrate phyla, application of fossils to studies of rock sequences, interpretation of geologic history from geologic maps and sedimentary rocks. *Prereq. GEO 1222; may be taken concurrently.*

GEO 1250 Advanced General Geology 4 QH

Offers an introduction to new and advanced concepts, theories, and hypotheses in geology through discussions, research papers, and individual projects. *Prereq. GEO 1212 and GEO 1222.*

GEO 1308 Petrology 5 QH

The hand specimen and field identification of the common igneous, sedimentary, and metamorphic rocks. Considers the modes of origin and important properties of common rock types. *Prereq. GEO 1212.*

GEO 1310 Descriptive Mineralogy 5 QH

Provides a study of mineralogy, including crystallography and physical, chemical, and descriptive mineralogy of the common rock-forming minerals. *Prereq. Two quarters of chemistry.*

GEO 1311 Optical Crystallography 5 QH

Studies the theory and practical methods of optical crystallography, including the basic techniques for determining the optical constants of crystals using the polarizing microscope and immersion media. *Prereq. GEO 1310.*

GEO 1312 Petrography 5 QH

Topics include description and identification of rocks and rock-forming minerals using thin-sections and the petrographic microscope; discussion of textural and mineralogic relationships. *Prereq. GEO 1311.*

GEO 1320 Field Geology 4 QH

Focuses on field techniques as a working guide for the approach, pursuit, and solution of geologic problems. Considers such techniques as geologic map construction, stratigraphic section measurement, and field rock description. Lab consists of field research at a quarry, roadcut, or other geologic exposure. *Prereq. GEO 1212.*

GEO 1412 Geochemistry 4 QH

Offers an evaluation of chemical processes important in the various geologic environments and their effects on the development of the lithosphere. *Prereq. One year of chemistry.*

GEO 1414 Igneous and Metamorphic Petrology 5 QH

Covers the origin and distribution of igneous and metamorphic rocks as interpreted from their chemistry, mineralogy, and field relationships. Lab includes field and petrographic analysis of rock suites. *Prereq. GEO 1312.*

GEO 1416 Economic Geology 4 QH

Focuses on the genesis, associations, and occurrence of the major ore minerals, illustrated by studies of selected ore bodies of various types throughout the world. *Prereq. Department approval.*

GEO 1418 Structural Geology 5 QH

Covers the description and origin of large- and small-scale rock structures with emphasis on interpretation of the mechanics of deformation. Field and lab analyses of structural problems using maps, models, and rock specimens. *Prereq. GEO 1212 and GEO 1213.*

GEO 1420 Geophysics 4 QH

Studies the basic techniques of reflection and refraction seismology, gravity, aeromagnetic, and heat-flow techniques and the information they provide on the structure, composition, and dynamics of the Earth's interior. Emphasizes the application of these techniques to the search for economic minerals in the earth's crust. *Prereq. PHY 1231.*

GEO 1424 Stratigraphy 5 QH

Offers a study of paleoenvironments and sedimentary-basin analysis based on sedimentary structures, stratigraphic sequences, and fossils. Emphasizes use of geologic sections, drill-cores, and well-logs. Includes lab interpretation of sedimentary rock suites, maps, and sections. *Prereq. GEO 1222.*

GEO 1428 Invertebrate Paleontology 5 QH

Surveys major invertebrate phyla preserved in the fossil record. Discusses micro- and macro-evolutionary principles with consideration of adaptive and functional morphology and the role of paleoenvironments. Lab involves description and classification of fossil invertebrates. *Prereq. GEO 1222.*

GEO 1430 Sedimentation and Sedimentary Environments 5 QH

Describes the physical processes of sedimentation and their role in the interpretation of modern and ancient sedimentary environments. Lab concentrates on the interpretation and description of the physical and textural properties of sediments and sedimentary rocks.

GEO 1432 Sedimentary Petrology 5 QH

Topics include origin, classification, and petrography of the major groups of sedimentary rocks. Discusses the environments of deposition of the nonclastic rocks. Lab concentrates on thin-section study of sedimentary rocks. *Prereq. GEO 1311.*

GEO 1435 Coastal Processes 5 QH

Examines the effect of coastal marine processes and the resultant coastal responses. Topics include the dynamics of waves and currents and the associated erosion, transportation, and deposition of sediment, forming beaches, barrier islands, and cliffed structures. *Prereq. GEO 1212.*

GEO 1436 Marine Geology 4 QH

Compares the balance between major sedimentary and tectonic forces in ocean basins and margins to resulting ocean form. Topics include origin of continental shelves, shelf sedimentation and transport, deep-sea processes and sediments. Evaluates resource development of OCS oil, sand and gravel, and manganese nodules. *Prereq. GEO 1212.*

GEO 1438 Geology and Land-Use Planning 4 QH

Studies the causes and solutions of geologic environmental problems related to land use. Topics include the causes and prevention of land-use problems in areas of existing or potential landslides, subsidence, erosion, flooding, and groundwater pollution. *Prereq. GEO 1140, GEO 1212, or permission of instructor.*

GEO 1440 Geomorphology 5 QH

Focuses on the origin and evolution of landscape features by processes operating at or near the Earth's surface. *Prereq. GEO 1212.*

GEO 1442 Water in Environmental Planning 4 QH

Examines aspects of surface runoff from geomorphic and hydrologic perspectives. Develops methods for description and calculation of major river and drainage basin processes and applies the results to the planning process. Examines human modification of these systems, including urbanization, dams, and channelization, and applies this information to an understanding of regulatory

processes. (VI) *Prereq. GEO 1212 or permission of instructor.*

GEO 1444 Glacial and Pleistocene Geology 5 QH

Covers the processes of ice movement and the characteristics and distribution of erosional and depositional structures associated with past and present glaciers; introduces Pleistocene chronology and correlations. *Prereq. GEO 1222.*

GEO 1446 Hydrogeology 4 QH

Topics include origin, distribution, and flow of groundwater in permeable sediments and bedrock; hydrological and geological characteristics of aquifers; regional flow systems emphasizing rock structure, stratigraphy, and other aspects of the geological environment; principles of hydrogeology mapping and analysis; and introduction to well design and well hydraulics. *Prereq. GEO 1212, MTH 1107 or 1123, or permission of instructor.*

GEO 1448 Groundwater Geochemistry 4 QH

Important geological processes (formation of soil, some ore deposits, caves, sinkholes) occur when groundwater interacts with rock or soil. In turn, these reactions modify groundwater chemistry and may either improve or worsen water quality. The course investigates these processes as well as groundwater contamination and dispersion, isotope tracer studies, field sampling, and analytical methods. *Prereq. Two quarters chemistry.*

GEO 1450 Geology Seminar 4 QH

Offers in-depth study, on an individual or small-group basis, of a selected geologic topic. Requires both oral and written presentations. *Prereq. Major in geology or senior status.*

GEO 1722 Historical Geology (Honors) 4 QH

Honors equivalent of GEO 1222. (II)

GEO 1754 Planetary Astronomy (Honors) 4 QH

Honors equivalent of GEO 1154. (V)

GEO 1816, GEO 1817 Undergraduate Research 4 QH each

Offers independent research on a selected topic under the direct supervision of a faculty member. *Open only to juniors and seniors majoring in geology, with the recommendation of the supervising faculty member and of the department.*

GEO 1820, GEO 1821 Directed Study 4 QH each

Offers independent study of a specific topic not normally contained in the regular course offerings, but within the area of competence of a faculty member. *Open to all students with the recommendation of a faculty member and departmental approval.*

GEO 1824, GEO 1825 Special Studies 1 QH each

Offers independent study of a specific topic. *Open to all students with the recommendation of a faculty member and departmental approval.*

History

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HST 1101 Western Civilization to 1648

4 QH

Surveys Western lifestyles, events, institutions, and culture from the earliest human societies through the end of the Thirty Years War. Focuses on Bronze Age civilizations and the origins of universalist religions, Greco-Roman civilization, early Christianity, Islam, the Germanic and Arab successor states to Rome, medieval civilization, the Renaissance and the age of exploration, the Protestant and Catholic reformations, the religious wars that ensued, and the economic transformations that occurred simultaneously. Emphasizes those elements that influenced the development of Western civilization and values. (II) *Not open to students who have completed HST 1121 or HST 1701.*

HST 1102 Western Civilization since 1648

4 QH

Surveys the development of Western—largely European—society and values from the rise of the dynastic and bureaucratic states to current Soviet reforms and the integration of the western European economy. Covers royal absolutism, the rise of the scientific world view, the political and economic revolutions that transformed Europe at the end of the eighteenth century, the development of nationalism and Marxism, the race for colonies, the cultural transformations of the early twentieth century, World War I and the Russian Revolution, the crisis of capitalism and the rise of fascism, World War II and the Holocaust, the Cold War and decolonization, and the current state of Western civilization. (II) *Not open to students who have completed HST 1122 or HST 1702.*

HST 1121 World Civilization to 1648

4 QH

Surveys the development of human institutions from ancient times through the crisis of the mid-seventeenth century. Emphasizes the continuities and changes that occur within civilization and the similarities, differences, and relationships that exist among contemporary civilizations around the world. Covers such topics as the rise of the world's great religions, the military and trading relationships among the various regions of the ancient and medieval worlds, the economic and technological revival of Europe in the early modern period, and the expanding struggle for resources in the crisis atmosphere of the seventeenth century. *Not open to students who have completed HST 1101 or HST 1701.* (IV)

HST 1122 World Civilization since 1648

4 QH

Examines the world from 1648 to the present. Emphasizes the intellectual, technological, and political expansion of Europe and the reactions of the rest of the world. Covers such topics as the global development of modern dynastic and bureaucratic states; the expansion of the European economy with its attendant trade wars; imperial expansion and the explosion of the slave trade; the development and reaction of American Indian, Asian, and African civilizations to that imperialism; the sporadic extension and eclipse of colonialism; and the growing tensions between traditional patterns of loyalty and authority and national, regional, and even global systems and cultures as we approach the twenty-first century. *Not open to students who have completed HST 1102 or HST 1702.* (IV)

HST 1201 The United States to 1877

4 QH

Focuses on the history of the American people from 1763 to 1877, with an analysis of the American Revolution and the major political, constitutional, diplomatic, economic, and social problems of the new nation. (II)

HST 1202 The United States since 1877

4 QH

Continues the survey of American history, with discussion of the emergence of an industrial economy, an urban society, world responsibility, and expanded federal government. (II)

HST 1241 The Historian's Craft

4 QH

Examines the ways in which the historian studies the past and the nature of historical statements. Problems considered include research techniques, changing conceptions of historical knowledge, and the relation between the historian and the society in which he/she works. (II)

HST 1251 Social Science Methodology

4 QH

Offers an introduction to social science methodology and quantitative techniques used in historical analysis.

HST 1270 Introduction to Public History

4 QH

Explores the field of public or applied history by surveying its components, including historic preservation, oral history, historical editing, historical archeology, genealogy, family history, business history, local history, material culture,

historical resource management, museology, historical research for media, archival management, management of nonprofit organizations, and policy history.

HST 1301 Topics in European History (Group A or B) 4 QH
Covers topics in European history from antiquity to the present.

HST 1311 Ancient Greece (Group A) 4 QH
Topics include the origins and development of Greek civilization; political evolution of Hellenic society from tribal to city-state organization; and growth and application of Greek religious, political, and ethical ideas. (III)

HST 1315 Ancient Rome (Group A) 4 QH
Examines Roman civilization in two sequences: the rise of Roman power under the Republic and the decline of Roman power under the Empire.

HST 1321 Medieval Europe (Group A) 4 QH
Topics include Europe from the barbarian invasions to the late thirteenth century; the expansion of Christianity and the institutionalization of church and papacy; the emergence of the Holy Roman Empire, England, and France as political units; and social, cultural, and economic developments. (III)

HST 1331 Renaissance Civilization (Group A) 4 QH
Focuses on Europe from 1300 to 1500, when alternatives to medieval institutions became increasingly apparent. Gives special attention to political, economic, and cultural changes in Italy and northern Europe. (III)

HST 1355 Tudor England (Group A) 4 QH
Provides a study of England from the late fifteenth to the early seventeenth century. Topics include an examination of the Tudor contribution to the development of political and social institutions; the Protestant Reformation and the relation between religion and politics; social and economic changes and their relation to the Elizabethan Renaissance. Particular emphasis is placed on intellectual and cultural developments and England's relation to Europe and the New World.

HST 1358 Stuart England (Group A) 4 QH
Studies seventeenth-century England, from the reign of James I. Topics include the social, economic, and political backgrounds of the English Civil Wars or Puritan Revolution; the age of Cromwell; the restoration of the Stuarts; the Glorious Revolution; and the end of the Stuart dynasty. Uses seventeenth-century sources and literature in addition to modern texts.

HST 1390 Population in European History (Group A or B) 4 QH
Examines, through population studies, the causes and consequences of changes in human birth, death, marriage, and migration rates from the Old Stone Age to the late twentieth century. Discusses the interaction and impact of climate change,

epidemic disease, war, economic development, and political policy, as well as changes in the structure and function of human family and child-rearing systems. (III)

HST 1393 History of Science and Technology (Group A or B) 4 QH

Offers an interdisciplinary survey of the development of science and technology, integrating theories of the philosophy and sociology of science within a historical framework. Emphasizes the environmental and ideological conditions that contribute to the birth and growth of the various sciences and to the relation between these conditions and technological innovation.

HST 1395 History of Flight and Space Travel (Group A, B, or C) 4 QH

Beginning with the dreams of flight of the ancient Greeks and Leonardo da Vinci, the course traces the history of nonpowered flight from the balloon experiments of the Montgolfier brothers to contemporary hang gliders; powered flight from the Wright brothers to the SST; and rocketry and space travel from its earliest beginnings to "Enterprise."

HST 1407 Europe, 1870-1921 (Group B) 4 QH

Focuses on Europe from the Franco-Prussian War to the post-World War I settlement: the growing tensions and rivalries and the declining certainties of the end of the nineteenth century, the origins of World War I, the war itself, the Russian Revolution, and the Peace of Paris.

HST 1408 Europe since 1921 (Group B) 4 QH

Focuses on Europe from the Versailles Settlement: the rise of totalitarianism, the Depression, the crises of liberalism and of the European mind, the Appeasement Era, World War II, the Cold War, the end of colonialism, and Europe today.

HST 1421 England since 1688 (Group B) 4 QH

Focuses on England from the Glorious Revolution to the present, with emphasis on the development of Parliament, the Industrial Revolution, nineteenth-century reaction and reform, the world wars, and the rise of socialism.

HST 1424 Victorian England (Group B) 4 QH

Discusses the economic, social, and political life of the English people during Victoria's reign. (IV)

HST 1425 The Decline of Great Britain (Group B) 4 QH

Discusses the economic, social, and political life of the English people in the twentieth century. (IV)

HST 1428 Irish Civilization (Group B) 4 QH

Examines the history of Irish civilization from the earliest hero sagas and their impact on Irish values to the Irish independence movement, the prototype for many other twentieth-century liberation movements. (IV)

HST 1429 Introduction to Irish Studies (Group B) 4 QH

Presents Irish studies in one-week sequences from the perspective of a number of fields: art, business, drama, history, literature, music, politics, and sociology. Introduces students to the important forces that have helped to shape contemporary Ireland and Irish-American culture. Same as INT 1252. (IV)

HST 1433 The French Revolution and Napoleon (Group B) 4 QH

Examines the history of France in the age of the *ancien regime* and the Enlightenment as background for the French Revolution and Napoleon.

HST 1434 Modern France (Group B) 4 QH

Surveys the chief political, social, economic, intellectual, and cultural developments of France from the Revolution to the present. (IV)

HST 1435 History of Modern Italy (Group B) 4 QH

Offers a survey of the social, economic, and political development of the modern Italian state from the seventeenth century to the present. Emphasizes the problem of modernization.

HST 1441 Hitler's Germany (Group B) 4 QH

Offers a study of the origins and nature of Hitler's Third Reich, emphasizing the personal lives of Nazi leaders in an attempt to understand how seemingly ordinary people could enthusiastically promote wars of aggression and revel in genocidal policies.

HST 1451 Imperial Russia (Group B) 4 QH

Focuses on the emergence of Russia as a recognized European power, westernization and expansion in the eighteenth century, the impact of Napoleon, and reform and revolution.

HST 1452 Soviet Russia (Group B) 4 QH

Examines forces molding the history of Russia since 1917, including both internal developments and foreign relations. (IV)

HST 1471 Class, Love, and Power in Western Europe (Group B) 4 QH

Provides an examination of social change in Europe since 1800 with emphasis on the interaction of industrialization, class movements, demographic trends, and revolutionary upheavals.

HST 1472 The Family in European History (Group B) 4 QH

Examines issues in the history of the European family from the late Middle Ages to the present. Topics include marriage and sexuality, child-rearing practices, the effect of industrialization and revolution on family life, the Victorian family, and the evolution of the modern family. Students will prepare their own family histories.

HST 1473 Women in Modern Europe (Group B) 4 QH

Examines the situation of women in Western Europe from the French Revolution to the 1950s, focusing on France, Britain, and Germany. Topics

explored include women in revolutionary movements, the impact of industrialization on women and the family, women in the labor movements, the struggle for suffrage, and the effects of world wars on women.

HST 1481 The Culture of Europe (Group B) 4 QH

Provides an analysis of the culture of the West in the nineteenth and twentieth centuries, focusing on the conjunction of social, cultural, and psychological forces that encouraged or retarded creativity. Considers the interconnections among the arts, social sciences, and sciences within each of the periods covered. (III)

HST 1485 Communism and Revolution (Group B) 4 QH

Focuses on the history of socialism and revolution from the early nineteenth-century utopias to the New Left of the 1960s.

HST 1490 Introduction to Women's Studies: Image, Myth, and Reality (Group B or C) 4 QH

Introduces the issues and methodology involved in the interdisciplinary study of women. Encompasses the historical, political, economic, and social processes that have created both the image and the reality of women in society. Uses guest lecturers to provide an overview of the many disciplinary approaches to the study of women. This course is required for women's studies minors and can be used as a general elective or, depending on the discipline of the coordinator, to satisfy specific concentration requirements. Same as INT 1150. (II)

HST 1491 Modern Western Economic History (Group B or C) 4 QH

Surveys the development of the Western world within the framework of economic theory, with attention to social and political ramifications. (III)

HST 1493 Work and Leisure (Group B or C) 4 QH

How we work and how we play are important determinants of how we live. This course examines the historical evolution of contemporary patterns of work and leisure across cultural, sexual, and class lines. Subjects include the impact of machine technology on the worker and the workplace, workers' organizing in unions and professional groups, changing concepts of the use of time, women's work and women's leisure; recreation and sports (both participant and spectator); and the rise of the cafe and the saloon as sociable institutions. (III)

HST 1494 History and Film (Group B or C) 4 QH

Explores various historical issues as seen through the eyes of historians and filmmakers. Presents both acted and documentary films in combination with readings from a variety of source and interpretive materials. (II)

HST 1495 Technological Transformations of Society (Groups B, C, or D) 4 QH

Examines the relation between technological innovations and the world in which they take place. Discusses conditions necessary for discovery and innovation and the impact of technology on political, economic, and social environments.

HST 1496 War in the Twentieth Century (Group B, C, or D) 4 QH

Provides an analysis of the causes, prosecutions, and effects of the major wars fought in the twentieth century, concentrating on the First and Second World Wars and on the Vietnam War.

Using film, simulations, and other materials, classes explore the economic, social, cultural, and psychological impacts of these wars as well as their political, diplomatic, and material aspects.

HST 1497 The World since 1945 (Group B, C, or D) 4 QH

Offers a thematic study of issues and movements that have influenced the world's history since the end of the Second World War. Subjects include the Cold War, the end of colonialism, urbanization, technology and ecology, cultures and counter-cultures, the "global village," and the prospects for human liberation.

HST 1501 Topics in American History (Group C) 4 QH

Covers special topics in the history of the people of the United States from 1789 to the present.

HST 1510 Colonial America (Group C) 4 QH

Covers the discovery and exploration of the New World, the settlement of the English colonies on the North American mainland, their development to 1763, and the origin of their clash with England. (III)

HST 1511 The American Revolution (Group C) 4 QH

Focuses on the coming of the American Revolution, its nature and progress, and its political, economic, and social aftermath.

HST 1514 The Civil War and Reconstruction (Group C) 4 QH

Focuses on the Civil War, its coming, its nature and progress, and the aftermath of Reconstruction.

HST 1516 The United States, 1898–1939 (Group C) 4 QH

Examines social, economic, political, and diplomatic changes from the Progressive Era through the Great Depression and the New Deal.

HST 1517 The United States, 1939–1960 (Group C) 4 QH

Examines social, economic, political, and diplomatic changes from the start of World War II to the election of John F. Kennedy.

HST 1518 The United States since 1960 (Group C) 4 QH

Examines social, economic, political, and diplomatic changes in the United States since 1960.

HST 1525 African-American History (Group C) 4 QH

Provides an in-depth examination of the major topics that have shaped the African-American experience. Topics included are slavery and its effects, the role of the antebellum free black, the Civil War and Reconstruction, black response to the new racism of the late nineteenth century, the W.E.B. DuBois–Booker T. Washington controversy, Marcus Garvey and the shaping of twentieth-century black nationalism, and the changing nature of the black revolution from Martin Luther King, Jr., to Malcolm X and beyond. Same as AFR 1131. (III)

HST 1526 African-American History since 1900 (Group C) 4 QH

Examines the rising tide of African-American nationalism during the twentieth century, with special emphasis on the founding of the NAACP, the Garvey movement, the Harlem Renaissance, the founding of the Black Muslims, A. Philip Randolph's March on Washington movement, the rise of Martin Luther King, Jr., and the demand for change epitomized by the concept of Black Power. Same as AFR 1132.

HST 1533 History of Boston (Group C) 4 QH

Explores the history of Boston from colonial times to the present, with attention to the topographical growth and the ethnic composition of the city.

HST 1539 American Jewish History (Group C) 4 QH

Examines Jewish political, social, and cultural history from the arrival of the first group of Jews at New Amsterdam in 1654 to the present. Themes covered include immigration, assimilation, family life, religion, anti-Semitism, Zionism, the Holocaust, and American-Israeli relations.

HST 1543 American Urban History (Group C) 4 QH

Examines the development of urban society in the United States in the nineteenth and twentieth centuries, with emphasis on the effects of immigration and industrialization upon the politics, thought, and society of American cities. (VI)

HST 1544 Environmental History of the United States (Group C) 4 QH

Examines American attitudes and practices toward natural and artificial environments from the first exploration to the present, paying special attention to literature, art, and landscape design.

HST 1553 The Family in American History (Group C) 4 QH

Explores the history of the family, including the African-American family, in pre-modern and modern American society. Focuses on the traditional and modern roles of parents and children. Investigates patterns of sexuality, marriage, childrearing, work, play, death, and dying. Compares various family types, including elites, middle class, and indigent. Evaluates external forces affecting family structure and life,

such as geographical mobility, industrialization, and warfare.

HST 1554 Women in America (Group C) 4 QH

Offers an analysis of women's economic and social roles from the colonial period to the present, with special attention to women's work, their roles in family and community, and nineteenth- and twentieth-century women's rights movements. (III)

HST 1555 American Elites (Group C) 4 QH

Examines the life of elite individuals and groups in American society, especially in the nineteenth and twentieth centuries.

HST 1563 History of Sport in America (Group C) 4 QH

Provides a history of the major sports and their impact on American life.

HST 1571 American Business History (Group C) 4 QH

Examines the rise of business in America, the role of the corporation, horizontal and vertical combinations, business and labor, and business and government.

HST 1575 History of Media in America (Group C) 4 QH

Focuses on mass communication in American history, with attention to the role of books, newspapers, magazines, films, radio, and television.

HST 1577 America and the Sea (Group C) 4 QH

Topics include the history of exploration and discovery of America, the development of fishing, the rise of ocean commerce, and the history of the American Navy.

HST 1578 The Automobile in America (Group C) 4 QH

Focuses on the impact of the automobile on American society in a historical context. Topics include the abandonment of traditional prohibitions of motorized carriages; the use of planning, taxes, and highway policies to foster the use of the automobile; the effect of the car on land use, recreation, and the economy; and contemporary issues such as pollution and energy.

HST 1581 The Growth of American Government to 1935 (Group C) 4 QH

Examines the expansion of government from the late nineteenth century to the Great Depression of the 1930s, focusing on the growth of the federal government, the presidency from Cleveland to Roosevelt, and new public policies.

HST 1582 The Growth of American Government Since 1935 (Group C) 4 QH

Examines the expansion of government from Roosevelt to the present, focusing on the reasons for the growth and its consequences, the development of major public policies, and the transformation of the federal role and politics.

HST 1585 American Diplomatic History (Group C) 4 QH

Focuses on the formation and administration of American foreign policy from the Revolution to the present.

HST 1586 American Military History (Group C) 4 QH

Surveys the complex relationship between American society and war, from the age of muskets to the neutron bomb.

HST 1591 China and the United States (Group C or D) 4 QH

Examines the relations between China and the United States, including the period of the missionaries and opium traders; the era of special privileges; the Open Door policy; the first half of the twentieth century, when China became America's favorite protégé; and the years of strain, warfare, and finally accommodation after the Chinese communists came to power in 1949.

HST 1592 History of the Vietnam War (Group C or D) 4 QH

Presents a history of military conflict in Vietnam with attention to the rise of the Viet Minh during World War II, the struggle against the French in the first Indochina war, the impact of the Cold War, and the involvement of the United States after 1950 in Laos and Cambodia as well as Vietnam. Emphasizes the roles of communism and nationalism in Indochina and the motives for American intervention. Films revealing American reaction to the escalating conflict will be shown.

HST 1604 Modern Latin America (Group D) 4 QH

Surveys Latin America from the mid-nineteenth century to the present. Topics include dictatorial republics and the continuation of poverty and injustice, the struggles toward democracy, the rise of nationalism, the threat of communism, and the relations between the United States and Latin America.

HST 1605 The Modern Caribbean (Group D) 4 QH

Topics include the successful Haitian revolt against slavery, peasant movements after the abolition of slavery, the Marcus Garvey movement, Caribbean music and art, the Cuban revolution, Black Power, and American interventions in the Caribbean from the Spanish-American War to Grenada. This course is the same as AFR 1297.

HST 1610 Topics in Asian History (Group D) 4 QH

Covers special topics in the history of Asia.

HST 1612 The Modern Middle East (Group D) 4 QH

Focuses on the Middle East since 1800, with emphasis on the background of present problems. (VI)

HST 1613 Contemporary Middle East (Group D) 4 QH

Focuses on political, economic, and social developments in the Middle East since World War II.

HST 1614 The Middle East Today in Fact, Fiction, and Film (Group D) 4 QH

Presents a study of social, economic, and political changes and conflict in the lives of ordinary people who have been experiencing the recent crises reported in the media. Focuses on common experiences among various peoples—Turks, Armenians, Israelis, Arabs, and Iranians—and emphasizes significant themes: lifestyles, generational conflict, the changing role of women, ethnic or ideological conflict, and the prevalence of identity crises attending cultural and social disruption.

HST 1620 Early African Civilization (Group D) 4 QH

Studies the ancient empires of Africa, especially Chana, Songhai, Mali, Zimbabwe, the city-states of East Africa, and the Congo Kingdom. Includes Ethiopian and Egyptian history and controversies to 1800. Same as AFR 1191.

HST 1621 Modern African Civilization (Group D) 4 QH

Provides an introduction to modern Africa in the years from 1800 to 1960, showing how a new African civilization arose out of the conflict-ridden conditions imposed on the old. Themes include economic, social, political, religious, and artistic life, as well as the influences of slavery, colonialism, and nationalism. Same as AFR 1197. (IV)

HST 1623 West African History (Group D) 4 QH

Surveys the politics and economics of West Africa from the rise of the Mali Empire to the contemporary problems of national development for the countries from Senegal to Nigeria. Same as AFR 1403.

HST 1625 South African History (Group D) 4 QH

Presents the historical background to current conflict in the Republic of South Africa and in adjoining Mozambique, Zimbabwe, and Namibia. Examines the rise of the apartheid system—and the opposition and alternatives to it—through the themes of racial conflict, nationalism, and industrialization in this African setting. Same as AFR 1405. (VI)

HST 1633 Modern China (Group D) 4 QH

Explores the far-reaching political, economic, and social changes in China from 1800 to the present. Examines the decline of the empire, the impact of the West, the rise of nationalism, industrialization, the changing role of women, the origins of rural revolution, and establishing the Communist state.

HST 1634 Contemporary China (Group D) 4 QH

Examines Chinese polity, society, and economy from 1949 to the present, including the restructuring of urban and rural society in the 1950s, the rise of a new class, the emergence of factionalism, the

Cultural Revolution, and the impact of the post-Mao economic and political reforms.

HST 1637 Modern Japan (Group D) 4 QH

Surveys the evolution of Japan from a third-world nation to a superpower. Major themes include the breakdown of feudalism, the impact of the West, the Meiji Restoration, industrialization, militarism, and Japan's post-World War II modern economic miracle.

HST 1644 Third World Women (Group D) 4 QH

Explores the role of women in the less-developed third world areas, with special emphasis on factors of change, development, and continuity. (IV)

HST 1652 Islam Resurgent (Group D) 4 QH

Analyzes what has been called "the militant revival of Islam" as a rallying point for reformist or revolutionary movements in the Muslim world. Includes little-known Muslim areas outside the Middle East in Africa and Asia. (VI)

HST 1701 Western Civilization 1 (Honors) 4 QH

Honors equivalent of HST 1101.

HST 1702 Western Civilization 2 (Honors) 4 QH

Honors equivalent of HST 1102.

HST 1711 America to 1877 (Honors) 4 QH

Honors equivalent of HST 1201.

HST 1712 America since 1877 (Honors) 4 QH

Honors equivalent of HST 1202.

HST 1790 Population in European History (Group A or B) (Honors) 4 QH

Honors equivalent of HST 1390.

HST 1801 Directed Study 4 QH**HST 1805 Approaches to History 4 QH**

Students will undertake a major historical project based on the application of appropriate methodologies and upon the substantive understanding of a single subject chosen by the course instructor and announced in advance of the quarter. The course is rotated among the department's faculty. All history majors are required to take this course, though it is open to all upperclass students. All students must have completed 80 quarter-hours of work before taking this course.

HST 1811, HST 1812, HST 1813 4 QH each**Junior/Senior Honors Program**

For details contact the Honors Office, 215 Lake Hall.

HST 1821 Fieldwork in History 1 4 QH

Offers directed work in historical societies, archives, museums, and other historical agencies. Students should consult the Department of History for details. *Prereq.* HST 1101, HST 1102, HST 1201, HST 1202, and 16 QH in other history courses.

Interdisciplinary Courses

Numbers inside parentheses within course descriptions refer to core curriculum categories listed on page 3.

INT 1110 American Musical Theatre

4 QH

Offered by the Department of Drama and Music. Traces the development of the American musical from works such as *The Black Crook* to the present. Considers the role of musical theatre as both entertainment and serious art form through an examination of script, score, dance, and design. Includes works by composers and lyricists such as Bernstein, Rodgers and Hammerstein, the Gershwins, Weill, Lerner and Loewe, and Cole Porter.

INT 1140 War and Conflict in the Nuclear Age

4 QH

Provides perspectives on the nature and effects of nuclear weapons and their impact on global politics. Explores differing views on policies that might prevent nuclear war.

INT 1150 Introduction to Women's Studies: Image, Myth, and Reality

4 QH

This is an introductory survey of the issues and methodology involved in the interdisciplinary study of women. Such a survey encompasses the historical, political, economic, and social processes that have created both the image and the reality of women in society. Guest lecturers provide an overview of the many different disciplinary approaches to the study of women. This course is required for women's studies minors and may be used as either a general elective or, depending upon the discipline of the coordinator, to satisfy specific concentration requirements. (II)

INT 1151, INT 1152 Women's Studies: Seminars in Research

4 QH

These interdisciplinary women's studies seminars allow students to address problems in depth by researching a topic of particular interest. Careful development of a research plan is encouraged, and opportunities are provided for sharing work in progress and for exchanging findings. These findings involve little in-class time, but much consultation with appropriate faculty. The final product of seminar work and research is a major paper. Students in the Honors Program may substitute one quarter of honors registration for each seminar, but are still expected to attend the formal sessions of the seminar. These seminars are required for women's studies minors.

INT 1165 Special Topics in Sport and Society

4 QH

Designed to augment a variety of courses offered in the area of sports studies. Content varies depending on the resources and staff available; previous offerings have examined the relationships between sports and the law and sports and business.

INT 1201 An Analysis of American Racism

4 QH

This seminar in contemporary aspects of racism in America discusses the cycle by which racism in our institutions helps form our attitudes and the manner in which our attitudes, in turn, shape our institutions. Emphasizes the practical, day-to-day aspects of racism, rather than the theoretical and historical.

INT 1215 Into the Ocean World

4 QH

This course is a comprehensive interdisciplinary introduction to the oceans. The seas' complexity and the far-reaching consequences of our interactions with them demand an awareness of the many facets of marine study. The teaching team consists of specialists in the sciences, social sciences, humanities, and arts, each with an interest in marine issues and a commitment to bridging the gaps among disciplines. The course themes are as broad as the oceans, but, when appropriate, we focus on Boston harbor, a first step into the ocean world for those of us in this area.

INT 1216 A History of Seafaring

4 QH

This course surveys maritime transportation, trade, travel, exploration, and warfare from approximately 3500 B.C. to the end of the wooden boat era in the late nineteenth century. Prior to the widespread application of steam power on land and sea in the nineteenth century, ships were the fastest, safest, and most economical means of transporting large cargoes over long distances. Literary and art history sources are also introduced, along with several films on maritime archaeology.

INT 1217 Water: Planning for the Future

4 QH

This course is an interdisciplinary introduction to our most precious resource. Water has affected our bodies, our planet, our history, and our culture. How we manage it will shape our future. Because of increasing demand, waste, and pollution, we are depleting—and risk destroying—the limited supply of usable fresh water. This course will look at water through scientific, historical, and cultural viewpoints, and survey contemporary water problems in all their dimensions—political, economic, and technological. (VI)

INT 1252 Introduction to Irish Studies

4 QH

Presents Irish studies in one-week sequences from the perspective of a number of fields: art, business, drama, history, literature, music, politics, and sociology. Introduces students to the important forces that have helped to shape contemporary Ireland and Irish-American culture.

INT 1320 Exploring the Humanities Through Film 4 QH

Investigates the ways in which the methods of the humanities can expand one's awareness of the sources, statements, and meanings of popular films. Presents series of movies for evaluation in the light of readings, the various approaches presented by faculty members from a number of humanistic disciplines, and students' own experience. (II)

INT 1321 Modernism: Art, Film, and Literature 4 QH

Examines the interrelation of film, art, and literature in the major movements of the twentieth century to 1939. Studies Futurism, Cubism, Expressionism, Dada, and Surrealism, featuring European films, art, and literature in a comparatist perspective. Examines the persistence of modernist elements in contemporary art, literature, and film. Research paper or creative project due at the end of the term. Team-taught by members of the art, English, and modern languages departments.

INT 1333 Senior Seminar in Human Services 4 QH

Designed for seniors in human services, the course examines emerging roles and career options within the human services field. Study will focus on self-examination of attitudes and values affecting delivery of services, exploration of ethical issues and dilemmas relevant to human services, grantsmanship and funding issues, staff supervision and development within human services agencies, and refinement of group leadership skills.

INT 1336, INT 1337 Field Experience in Human Services 1 and 2 6 QH each

Human services students are required to fulfill two fieldwork placements during the last two years of their program. Each placement consists of 150 hours on-site and generally varies according to the students' interest. Examples of placement sites include community centers, nursing homes, vocational workshops, state and federal agencies for children, and recreational facilities. Experiences are supervised by University staff to maximize the students' learning opportunities. Junior or senior status, by permission only.

INT 1570 On Understanding Science 4QH

Develops the quantitative and qualitative skills needed to critically read about science in newspapers and magazines. Examines the historical, philosophical, and social nature of science; units and scientific notation; technological developments of the last two hundred years; sources of information; and current scientific developments.

INT 1580 Physical Chemistry with Biological Applications 4 QH

Examines physiochemical principles as they apply to biological processes. Topics include chemical equilibria, reaction kinetics, basic thermodynamics, oxidation-reduction reactions and bioenerget-

ics, and transport. Emphasizes problem solving as a tool for learning, using a quantitative approach. Explains basic assumptions and limitations underlying principles; for the most part, however, rigorous derivations are avoided. Makes applications to basic experimental techniques in biochemistry by way of relevant biochemical examples. *Prereq.* BIO 1261.

INT 1700 War and Conflict in the Nuclear Age (Honors) 4 QH

Honors equivalent of INT 1140. Discusses the development of nuclear weapons. Explores the decisions leading to and the aftermath of the nuclear attack on Hiroshima and Nagasaki. Examines the Cold War and the growth of nuclear arsenals, the potential causes of a nuclear war and the probable effects, and this issue's moral questions. Evaluates strategies for preventing nuclear war. (VI)

INT 1702 War Work: The Experience of World War II (Honors) 4 QH

Examines the Second World War as an example of the impact external events can have on professions. This upperclass course is team-taught by faculty from various disciplines.

INT 1703 Environmental Policy (Honors) 4 QH

Evaluates law, policy, and scientific decision making in resolving environmental resource conflicts and in dealing with the health risks of new technologies. Introduces regulatory approaches including the Clean Water Act, wetlands protection, and toxic torts litigation.

INT 1704 Northeastern in the 1960s (Honors) 4 QH

Explores how college life and curricula have changed over the past twenty years by studying the microcosm of Northeastern University. Involves research papers on topics such as curriculum changes, student values as reflected in literature and folklore, and the Northeastern riots in comparative context.

INT 1705 Greek Language and Literature (Honors) 4 QH

Focuses on Attic Greek grammar and selections from Greek literature in the original language. Discussion of texts is major part of course.

INT 1706 Industrial Relations (Honors) 4 QH

Presents theories and applications of labor management relations through lectures and case discussions. Focuses on the development of American and European labor movements, emphasizing legal and economic factors. Topics include union objectives, organization, and structure; union government and democracy; collective bargaining; and management approaches to industrial relations.

INT 1707 Psychoanalytic Literature (Honors) 4 QH

Examines literature from a psychoanalytic perspective. Topics include Freud's theories, object relations, Lacan's theories, and Kohut's

self-psychology. Discusses works by Charles Dickens, Franz Kafka, Virginia Woolf, Doris Lessing, and Anne Tyler.

INT 1721 Modernism: Art, Film, and Literature (Honors)
Honors equivalent of INT 1321.

4 QH

Journalism

Please note that some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Office of the Dean before taking the course.

Numbers inside parentheses within course descriptions refer to core curriculum categories listed on page 3.

JRN 1103 Newswriting 1

4 QH

Covers functions of the editorial department and procedures in obtaining and writing news stories. Offers extensive news writing and an introduction to interviewing. Legal issues defined. Typing skills required. *Prereq.* ENG 1275 with grade of C or better.

JRN 1104 Newswriting 2

4 QH

Offers practice in multi-source and breaking stories. Provides an introduction to government and court reporting, advanced work in interviewing, and experience in writing under deadline pressure. Discusses legal issues. *Prereq.* JRN 1103 with grade of C or better.

JRN 1206 Editing

4 QH

Provides practice in copy editing and headline writing. Presents assignments in photo selection, cropping, and outline writing. Introduces page layout. *Prereq.* JRN 1104 with grade of C or better.

JRN 1250 Interpreting the Day's News

4 QH

Considers the news of the day and the function of the newspaper, news magazine, and news broadcasts in American life. Topics include rights and responsibilities of the press and how news is gathered, processed, and disseminated by the various media. (VI) *For nonmajors as well as majors.*

JRN 1301 Basic Photojournalism

4 QH

Covers camera and darkroom procedures along with cropping, assignment techniques, theory, and photo caption methods. *Prereq.* JRN 1104.

JRN 1305 Techniques of Journalism

4 QH

Provides practice in writing in-depth and multiplesource stories requiring significant research. Provides an introduction to investigative reporting, practice in feature writing, and a review of legal issues. *Prereq.* JRN 1104.

JRN 1320 Radio News Gathering and Reporting

4 QH

Covers writing and editing news for radio, with practice in interviewing, organizing news scripts, and integrating audio materials into broadcast. *Prereq.* JRN 1103.

JRN 1336 Public Relations Principles

4 QH

Presents the principles, history, and methods of public relations, processes of influencing public opinion, responsibilities of the public relations practitioner, and analyses of public relations programs. *Prereq.* Sophomore standing.

JRN 1350 Advertising Principles

4 QH

Covers the development, procedures, economic functions, and responsibilities of advertising: planning, research, production, and other elements that go into successful advertising. *Prereq.* Upperclass standing.

JRN 1421 Television Newswriting

4 QH

Covers writing for TV news as opposed to other news media, importance of the writer-reporter as field-producer and writer-producer, and terms and language used in the production of TV news shows. Includes actual individual production of news shows, field trips to TV stations, and guest lecturers from the TV news media. *Prereq.* JRN 1103.

JRN 1422 Television News Production

4 QH

Demonstrates techniques used by the electronic journalist and TV news producer. Provides the opportunity to build a TV news show and to do reporting with portable TV cameras and editing equipment. *Prereq.* JRN 1103 and JRN 1421, or permission of instructor.

JRN 1428 The Role of Journalism in Sports

4 QH

Offers an analysis of the impact of journalism on the institution of sports in this country and around the world. Considers sports reporting as a motivator and demotivator from Little League to college and professional levels. Looks at the effect of news media coverage on violence in organized sports, on America's physical fitness, and on other aspects of society.

JRN 1430 Fundamentals of Sports Reporting

4 QH

Applies principles of news reporting to covering men's and women's sports for print and broadcast media. Emphasizes using sports reference materials, developing contacts, interviewing, and

structuring the sports story. Also discusses investigative reporting in sports. *Prereq.* JRN 1104.

JRN 1432 Local Government Reporting 4 QH

Discusses coverage of town/city government, with emphasis on the "beat" approach to reporting public affairs. Focuses on practical, in-the-field experience with town meetings, meetings of boards of selectmen, and other commissions and bodies transacting public business. *Prereq.* JRN 1104.

JRN 1440 Design and Graphics 4 QH

Applies layout and design principles to newspapers, magazines and other print media. Covers type faces, copy measuring, dummyping, photo sizing, and keeping copy flow charts. Applies design and graphics principles to advertising layout. *Prereq.* JRN 1206.

JRN 1451 Advertising Copy Writing 4 QH

Covers theory and techniques of creating advertising copy for newspapers, magazines, radio, television, and direct mail. Emphasizes fact gathering, copy structure, and advertising design. *Prereq.* JRN 1103, and JRN 1350.

JRN 1460 Public Relations Problems 4 QH

Applies public relations techniques to actual problems; presents case studies in industry, labor, education, government, social welfare, and trade associations. *Prereq.* JRN 1336.

JRN 1501 History of Journalism 4 QH

Traces the development of American journalism from its European and English beginnings. Topics include the colonial press, the great personal journalists of the nineteenth century, and the impact of major technological changes in mass communications media in the twentieth century. Some writing required. *Prereq.* *Upperclass standing.*

JRN 1508 Law of the Press 4 QH

Examines legal problems of libel, invasion of privacy, and access to government information; discusses the balance between private rights and the public's "need to know." *Prereq.* *Upperclass standing.*

JRN 1512 Journalism Ethics and Issues 4 QH

Explores the responsibilities of news media and ethical issues confronting decision-makers in journalism. Examines the principles found in codes of the American Society of Newspaper Editors, the Associated Press Managing Editors, the Society of Professional Journalists, and other organizations. Some writing required. *Prereq.* JRN 1501.

JRN 1522 Magazine Writing 4 QH

Covers writing and free-lancing magazine articles; analyzing magazines as markets; and selecting the best feature format—how-to-do-it, profile, personal experience, human interest, interpretive pieces, and others. *Prereq.* JRN 1104 or consent of instructor.

JRN 1540 Sports Public Relations 4 QH

Covers the planning and implementing of public relations functions for professional, amateur, and recreational athletic organizations. Topics stressed include use of journalistic research techniques, implementation of programs, and effective communication with news media and various publics. *Prereq.* JRN 1103, and JRN 1336.

JRN 1552 Advertising Practice 4 QH

Covers the preparation of advertising for print and broadcast media, including campaign planning and space and time buying and scheduling. Includes product research, consumer surveys, and measuring the effects of advertising. *Prereq.* JRN 1451.

JRN 1561 Public Relations Practice 4 QH

Demonstrates practices and techniques employed in the field, including organization of events and functions. Studies campaign planning, research, and media relationships. *Prereq.* JRN 1103 and JRN 1336.

JRN 1575 Publication Production and Management 4 QH

Examines the organizational structure, production methods, and management procedures of print media companies. Analyzes the interaction of business, advertising, production, and circulation departments. *Prereq.* JRN 1206.

H JRN 1617 The Constitution and Mass Communications 4 QH

Explores the meaning of freedom of the press through study and discussion of the evolving First-Amendment interpretations of the United States Supreme Court. *Prereq.* *Upperclass standing.*

JRN 1703 Newswriting 1 (Honors) 4 QH

Honors equivalent of JRN 1103.

JRN 1704 Newswriting 2 (Honors) 4 QH

Honors equivalent of JRN 1104.

JRN 1870, JRN 1880 Seminar 4 QH

Offers discussions and readings on topics of current significance in various journalistic fields. *Prereq.* *Upperclass standing.*

JRN 1890, JRN 1891 Directed Study in Journalism 4 QH each

JRN 1892 Topics 4 QH

Linguistics

The following linguistics courses are described under the different department headings. The interdepartmental major in linguistics and its corresponding minor are described on page 9 of this catalog.

English

- ENG 1118 Introduction to Language and Linguistics
- ENG 1119 History of the English Language
- ENG 1401 Introduction to Syntax
- ENG 1402 Grammars of English
- ENG 1407 Introduction to Semantics
- ENG 1408 Topics in Linguistics
- ENG 1690/ENG 1691 Junior/Senior Seminar
- ENG 1810/ENG 1811 Directed Study

Modern Languages

- LNF 1250 History of the French Language
- LNG 1801 Directed Study
- LNL 1235 Applied Linguistics 1
- LNL 1236 Applied Linguistics 2
- LNL 1260 Introduction to the Romance Languages
- LNS 1250 History of the Spanish Language

Philosophy and Religion

- PHL 1215 Symbolic Logic

- PHL 1440 Philosophy of Language
- PHL 1800 Directed Study

Psychology

- PSY 1262 Psychology of Language
- PSY 1263 Nonverbal Communication
- PSY 1264 Animal Communication
- PSY 1361 Introduction to Phonetics
- PSY 1362 Child Language
- PSY 1363 Linguistics of American Sign Language
- PSY 1365 Language and the Brain
- PSY 1562 Lab in Psycholinguistics
- PSY 1661 Seminar in Psycholinguistics
- PSY 1662 Seminar in Cognition
- PSY 1890 Directed Study

Sociology/Anthropology

- SOA 1335 Language and Culture
- SOA 1800 Directed Study

Modern Languages

Please note some courses in the College of Arts and Sciences are duplicated in different departments or colleges, or within a department. You may not receive credit for two such courses. If you have a question about whether one course does overlap with another, please consult the departments involved and the Office of the Dean before taking the course.

Prerequisites listed for modern languages are based on current course numbers at Northeastern. If approved by the Department of Modern Languages and the dean's office, equivalent course work acquired elsewhere may be considered acceptable to satisfy these prerequisites. The following courses are offered in English, and no knowledge of a foreign language is required to take them: LNF 1510, LNF 1511, LNF 1512, LNF 1513, LNI 1510, LNI 1511, LNI 1512, LNR 1500, LNR 1510, LNR 1511, LNS 1500, LNS 1501, and LNS 1510. Locate these courses under the appropriate heading for course descriptions. Language majors interested in obtaining major credit for any of these courses should consult their instructor.

Cinema

The following cinema courses are offered by the Department of Modern Languages. For additional cinema courses, consult the cinema listings.

LNF 1521 French Film Masterpieces **4 QH**

Provides an introduction to some of the qualities that have made French film one of the great national cinemas. Focuses on both form and content; relates outstanding directors' major works to the French culture and society of their period. Taught in English; may be taken for French credit if assignments are completed in French.

LNF 1550 Introductory Film Analysis **4 QH**

The course's major goal is the cultivation of critical skills in analyzing the film medium, enabling students to articulate ways in which film shapes their experience. The course will be presented in three units: Film Form, Narrative Form, and Film Style. Form, and its most prevalent manifestation, narrative form, can be said to be the way in which the parts of a film are related to one another to create a whole. Style, including mise-en-scène, cinematography, editing, and sound, will be studied in relation to audience expectations and the constitutive role of film form. The course will be organized around weekly film screenings and individual study of films put on reserve in the Media Center of Snell Library.

LNF 1551 Film Theory**4 QH**

Investigates the fundamental issues surrounding the nature and possibilities of film art. Introduces a variety of theoretical approaches, including semiotics, auteur theory, psychoanalysis, and feminism. Weekly screenings focus on two or three topics: a film author (such as Buñuel, Truffaut, or Welles), a well-defined film movement (such as neorealism, the New German cinema, or the French New Wave), or films about film-making practice. Coursework includes reading articles and writing a research paper using the resources (including film journals) of the Media Center of Snell Library. (V)

LNF 1560 Film and Psychoanalysis**4 QH**

This course will explore the nature and possibilities of the psychoanalytic interpretation of film. The course will demonstrate that such an approach offers an additional dimension to the analysis of a work of art. The principal focus will be on elements in the work that are derivative of unconscious processes. Thus, fantasies, dreams, symbolism, and imagery will be given special attention. Material in the works studied that relates to neurotic conflicts, character structure and formation, interpersonal relationships, and distortions in psychological development will be brought into the discussion. Weekly film screenings will be accompanied by lectures and discussions; each student will select one film (placed on reserve in the Media Center of Snell Library) for individual study on a topic of his/her choice.

LNG 1554 Modern German Film and Literature**4 QH**

Introduces contemporary issues in German culture. Studies the importance of the Faust legend as a striving for *Unendlichkeit*—going beyond normal human limitations—as expressed in the classicism of Goethe and the expressionist movement in art and film. Explores the balancing of Weimar as compared to Nazi culture. Examines the multiple pressures and complex issues of the postwar era as outgrowths of these earlier periods. Considers major novels, stories, and poems by Boll, Grass, Mann, and Brecht as adapted by a generation of new German filmmakers— Fassbinder, Schlöndorff, Sanders-Brahms, and Wenders. Offered in English; may be taken for German credit by special arrangement. (IV)

LNS 1550 Spanish Film Masterpieces**4 QH**

Covers Spanish cinema from 1960 to the present, focusing on recognized masters such as Buñuel and Saura, but including other award-winning films based on novels and events in the Spanish Civil War. Stresses the way the realism of the Spanish cinema is combined with surrealist imagery and metaphor to create a distinctive visual style and content.

Linguistics

The following linguistics courses are offered by the Department of Modern Languages. For additional courses, consult the linguistics listings on page 118.

LNF 1250 History of the French Language**4 QH**

Examines the development and emergence of the French language from its earliest literary manifestations. Offers the opportunity to become familiar with the language's earlier stages. Emphasizes developing a working knowledge of medieval French. Includes the relationship of Old French to Latin, structural characteristics of Old French, and the impact of historical events on language. Compares different stages of French. Conducted in English. *Prereq.* Reading knowledge of French or permission of instructor.

LNL 1235 Applied Linguistics**4 QH**

Explores the process of language learning and the nature of this experience for infants and adults. Emphasizes the child's ability to master successfully the complex essentials of a first language by the age of five. Focuses on the relationship between cognitive capacity and language-learning ability. Discusses the roles of the parent and the physical environment. Includes second-language learning, contrastive analysis, learning English as a second language or dialect, sign language, the significance of "errors," and learning strategies. Surveys language-teaching methods.

LNL 1260 Introduction to Romance Linguistics**4 QH**

Provides a general linguistic introduction to one of the most important language families. Discusses the structural characteristics of several Romance languages. Includes defining a language family, how and why languages change, and the relationship of standard and nonstandard linguistic varieties. Studies contemporary theoretical issues in Romance linguistics including object pronoun placement, word order, creolization, and subject pronouns use. Conducted in English. *Prereq.* Reading knowledge of one Romance language or permission of instructor.

LNS 1250 History of the Spanish Language**4 QH**

Examines the development and emergence of the Spanish language. Offers the opportunity to become familiar with the language's earlier stages. Emphasizes developing a working knowledge of medieval Spanish. Includes the relationship of old Spanish to Latin, structural characteristics of Old Spanish, and the impact of historical events on language. Compares different stages of Spanish. Conducted in English; however, the textbook is in Spanish. *Prereq.* Reading knowledge of Spanish or permission of instructor.

The following courses offered in the Department of Modern Languages are conducted in English for possible advanced language credit. Please consult instructor.

LNF 1510 Modern Philosophical French Literature in Translation 4 QH

Camus and Sartre are considered to have been the spokesmen for their generation's philosophical concerns. The course studies works by these two authors and from them develops a working knowledge of existentialism. Course given in English.

LNF 1511 The Theme of Solitude in French Literature 4 QH

The multiple facets of the theme of solitude are traced from the beginnings of French literature to the present. Viewed as a source of both wonder and anguish, solitude is studied in its various manifestations, including banishment, imprisonment, expatriation, and seclusion. The phenomena of moral and spiritual solitude are examined as well. Authors studied include Charles d'Orleans, Du Bellay, Rousseau, Chateaubriand, Hugo, Verlaine, Mauriac, and Camus. Course conducted in English. Texts read in English translation (those who wish to do so may read them in French).

LNF 1512 Masterpieces of Modern European Fiction 4 QH

Focuses on modern European authors, including Dostoevski, Kafka, Proust, Pirandello, and Lorca. Examines works in the context of the emergence of modernism and the break from literary tradition. Fiction readings are accompanied by critical and theoretical texts investigating the nature and function of literature in society.

LNF 1513 French Seminar: Voltaire and Rousseau 4 QH

This course offers an opportunity to study and compare the two great figures of the eighteenth century. Analyzes how, by their contrasting interests, personalities, and views of society, these writers contributed to fundamental changes in the political, philosophical, and literary world of their time—and ours. Includes class discussion, oral and written reports. Conducted in English.

LNI 1510 The Works of Dante in Translation I 4 QH

This course considers briefly the cultural background and various literary schools that influenced Dante. His life, his character, and minor works are discussed. The *Vita Nuova* and the first cantica of the *Divina Commedia*, the "Inferno," are read and analyzed in some detail. This course is intended for students of any background or major. Bilingual texts are used so that students with a background in Italian and others, may refer to the original for added interest and enrichment. Conducted in English. (III)

LNI 1511 The Works of Dante in Translation 2 4 QH

Continues LNI 1510, but may be taken separately. Studies in detail the other two parts of the *Divina Commedia*, "Purgatorio" and "Paradiso." Open to anyone. Bilingual texts used. Conducted in English.

LNI 1512 Italian Seminar: Pirandello 4 QH

By viewing reality in the world and human personality with strikingly new insights, Pirandello contributed a new dimension to our understanding of human nature and brought about significant changes to the traditional conception of the theatre. This course examines the originality and art of Pirandello by a close study of some of his great plays and short stories. Classwork includes discussions and oral and written reports. Conducted in English.

LNR 1500 Backgrounds in Russian Culture 4 QH

Designed to offer the student a view of Russian culture and civilization; includes guest speakers, films, field trips, and discussions. Conducted in English.

LNR 1510 The Works of Alexander Pushkin in Translation 4 QH

Offers a survey and analysis in English of Pushkin's artistic prose, lyric poetry, correspondence, friendships, and major literary influences.

LNR 1511 Russian Literature in Translation 4 QH

A companion to LNR 1510; provides a survey and analysis in English of some of the works of Tolstoy, Dostoevski, Chekhov, and others.

LNS 1500 Backgrounds in Hispanic Culture 4 QH

A multimedia approach is used to present the rich panorama of the humanities from Altamira to modern times. A reading knowledge of Spanish is helpful but not required, since the course is conducted in English. Field trips, concerts, guest speakers, and individual study projects enhance this exploration of Spanish creativity.

LNS 1501 Backgrounds of Latin American Culture 4 QH

Spans the time from pre-Columbian days to the present in Latin America, exploring culture, traditions, and attitudes. Offers a multimedia approach with field trips and guest lecturers. Conducted in English. (IV)

LNS 1510 Saints and Sinners: The Vision of Women in the Middle Ages and the Renaissance 4 QH

Topics include the attainment of and the atonement for love and society's changing attitude toward women as reflected in the literature of the times. Covers selected fabliaux, short stories, poems, and plays from Boccaccio, Chaucer, Ruiz, Rojas, Machiavelli, Lope de Vega, Calderon, Quevedo, Racine, Middleton, as well as women writers. Reference is made to historical and sociological materials. Conducted in English. All required readings are in translation.

LNS 1511 Introduction to Caribbean Literature 4 QH

Provides a comparative introduction to the modern literary traditions of the Spanish-, English-, and French-speaking Caribbean. Includes authors such as Carpentier (Cuba), Naipaul (Trinidad), Zobel (Martinique), and Cardenal (Nicaragua).

LNS 1512 The Don Juan Figure in Literature 4 QH

This seminar course deals with the emergence and development of the Don Juan figure in Western literature. The course will be taught in English, although it will focus upon many works which were originally written in other languages (they will be read in English translation). It will attempt to analyze the character of Don Juan, beginning with his first appearance in the theater of seventeenth-century Spain, and following his development well into the twentieth century. The course will strive to develop an appreciation and understanding of the character of Don Juan through the centuries, and to analyze the similarities and the differences that may be seen in the character from one cultural milieu to another. (III)

Chinese

LNC 1101 Elementary Chinese 1 4 QH

Designed to acquaint the student with features of spoken and written "Mandarin" Chinese. Stresses grammar, oral performance, and simple characters. Students who wish to speak another dialect of Chinese should consult instructor for proper placement.

LNC 1102 Elementary Chinese 2 4 QH

Continues LNC 1101. Studies grammar and spoken and written forms of the language. *Prereq.* LNC 1101.

LNC 1103 Intermediate Chinese 1 4 QH

Continues LNC 1102. Covers more advanced features of the language as well as continued study of characters. *Prereq.* LNC 1102.

LNC 1104 Intermediate Chinese 2 4 QH

Continues LNC 1103. Offers more advanced work in grammar, conversation, and characters. *Prereq.* LNC 1103.

LNC 1801 Directed Study in Chinese 4 QH

French

LNF 1101 Elementary French 1 4 QH

Designed for students with very little or no prior knowledge of French, this course provides a lively introduction to basic oral expression, listening comprehension, and elementary reading and writing. The audiolingual approach, using practical vocabulary drawn from realistic situations, aims at good pronunciation and ease in response. Each lesson incorporates helpful information about daily life in France and the varied cultures within the world of French speakers. Laboratory practice complements classwork, enables students to work aloud at their own speed, reinforces their acquisition of essential structures, and acquaints them with a vast library of audiovisual resources.

LNF 1102 Elementary French 2 4 QH

Continues beginners' exposure to the "four skills"—oral comprehension, speaking, reading,

and writing French—so that the linguistic tools needed to understand and function in foreign contexts—at home, abroad, and in the world of literature and film—may be acquired. *Prereq.* LNF 1101.

LNF 1103 Intermediate French 1 4 QH

Designed for students who wish to further their audiolingual skills and improve their reading and writing; combines a review and continued study of grammar essentials with oral, writing, and language lab practice. Varied readings include journalistic, cultural, and modern literary texts. Conducted primarily in French so that students may exercise their new skills. *Prereq.* LNF 1102 or equiv.

LNF 1104 Intermediate French 2 4 QH

This course uses the fundamentals of French to promote effective self-expression through speaking and writing and to explore the idiomatic aspects of the language. Through progressive class discussions and oral and written commentaries, students analyze a contemporary French novel or a French cultural reader, screenplay, or collection of short stories. The course strives, first, to help students read and comprehend modern French writing with confidence, and to be able to talk and write about it in good French; and second, to provide preparation for advanced courses. *Prereq.* LNF 1103.

LNF 1107 Reading French in the Arts and Sciences 4 QH

Designed for students who wish to develop their reading skills, without regard to other aspects of the language such as speaking and writing. Stresses the grammar necessary for reading, together with vocabulary building. Uses scientific and nonscientific texts. May help graduate and undergraduate students who need to pass a reading examination to fulfill specific degree requirements. Not a substitute for LNF 1103 or LNF 1104. *Prereq.* LNF 1102 or equiv.

LNF 1111 Elementary French for Business 4 QH

Similar to LNF 1101, but has added features relevant to business students, such as specialized vocabulary related to the business world and an immediate introduction to French business texts. LNF 1102 can be taken as a sequel to LNF 1111.

LNF 1201 French Composition and Conversation 1 4 QH

This course is designed for qualified students who wish to work on improving their proficiency in speaking and writing French through oral reports, class discussions, compositions, and an advanced review of fundamentals. Grammar work focuses on the students' particular needs as well as the nuances of the language. Varied readings in a range of styles—popular to literary—provide insight into French life and culture. Conducted in French.

LNF 1202 French Composition and Conversation 2 4 QH

Continues LNF 1201, with emphasis on individual work, oral presentations, discussions, related

grammar, and analysis of readings. Conducted in French. *Prereq.* LNF 1201 or equiv.

LNF 1203 Advanced French Proficiency 1 4 QH

Emphasizes further vocabulary building and mastery of fine points of grammar through written composition, prepared oral reports, and reading and discussion of articles from current periodicals. Gives special attention to the latest trends in spoken French, the study of idioms and proverbs, as well as selected examples of “argot” (slang). *Prereq.* LNF 1201 and LNF 1202 or equiv.

LNF 1204 Advanced French Proficiency 2 4 QH

Continues LNF 1203. Each student is expected to pursue one major project throughout the course, to be completed at the end of the quarter—such as planning and writing an original French magazine with one article to be submitted each week of the term. *Prereq.* LNF 1201 and LNF 1202 or equiv.

LNF 1225 Introduction to the French-Speaking World 4 QH

Offers a cultural introduction to the French-speaking world through the study of various reading selections in the textbook *Le Monde Français*. Stresses vocabulary building and proper usage of a wide variety of grammatical forms; also examines the traditional backgrounds and aspects, as well as the contemporary and “pop” aspects, of the cultural heritage of the world’s French speakers. Focuses mainly, but not exclusively, on France. *Prereq.* LNF 1104 or equiv.

LNF 1231 Masterpieces of French Literature 1 4 QH

Provides an introduction to French poetry, theatre (both comedy and tragedy), novels, and autobiographies through the study of key works from the Middle Ages and Renaissance through the Age of Enlightenment. Includes such writers as Villon, Molière, Racine, Voltaire, and Rousseau. Conducted largely in French. Designed to foster a critical approach to reading, improve reading, speaking, and writing skills; and help students apply these new skills to a greater understanding and appreciation of major French contributions to Western culture. Encourages group discussions in an effort to bring out the relation between the texts and contemporary issues. (II) *Prereq.* LNF 1104 or equiv.

LNF 1232 Masterpieces of French Literature 2 4 QH

Continues LNF 1231, which is not necessarily a prerequisite. Presents some of the most interesting and significant works of literature from the Romantic Age to the present. Readings include an “existential” play by Musset, poetry by Baudelaire and Verlaine, and fiction by Flaubert, Camus, and Robbe-Grillet. For a description of methodology, see LNF 1231. (II) *Prereq.* LNF 1104 or equiv.

LNF 1309 French Literature of the Nineteenth Century 1 4 QH

Romanticism is treated as a major cultural phenomenon affecting each person’s view of the

world and the way he/she expresses experience. In this context, the course examines romanticism in poetry and drama, as well as its continuation into the realist novel. Readings include Victor Hugo in poetry and the drama and Honoré de Balzac in the novel, as well as selections from other writers who represent aspects of romanticism and realism. Conducted principally in French. Offered every other year. *Prereq.* LNF 1232 or equiv.

LNF 1310 French Literature of the Nineteenth Century 2 4 QH

Explores the reaction against romanticism: aestheticism and personal modes of expression in contrast to the enthusiasm of the early romantics. Readings include a novel by Gustave Flaubert and the verse of Charles Baudelaire in *Les Fleurs du Mal*, as well as the poets who followed in his footsteps. Considers Flaubert and Baudelaire as precursors of modern literature. Conducted principally in French. Offered every other year. *Prereq.* LNF 1232 or equiv.

LNF 1311 French Literature of the Twentieth Century 1 4 QH

Offers a study of the major movements in the narrative and dramatic prose writers prior to World War II, including Alain-Fournier, Proust, Claudel, Gide, Mauriac, and Saint Exupéry. Requirements include reading a work from each author, discussing it in class, and presenting oral and written reports. Conducted in French, but English may be used. Offered in alternate years. *Prereq.* LNF 1232 or equiv.

LNF 1315 French Poetry, Past and Present 4 QH

From the Middle Ages to the present day, French poets have derived inspiration from such universal themes as love, nature, and the human condition. This course will provide students with a survey of French poetry through the ages, focusing on representative works of the major French poets. Poems will be studied in their literary and historical context, with an examination of various aspects of French versification. Conducted in French.

LNF 1801, LNF 1802, LNF 1803, LNF 1804, LNF 1805 Directed Study 4 QH each

Offers students a way of going beyond work given in the regular curriculum; may also enable students to complete major or minor requirements in certain situations. Will not be given in areas adequately covered by existing courses. Priority given to language majors and to juniors and seniors.

German

Prerequisites listed for modern languages are based on current course numbers at Northeastern. Equivalent coursework done elsewhere will be considered acceptable to satisfy these prerequisites.

LNG 1101 Elementary German 1 4 QH

Examines basic grammatical structure of German through practice in listening comprehension, speaking, reading, and writing. Includes classroom and language lab instruction. No previous study of German necessary. (Special sections of this course are run for business students.)

LNG 1102 Elementary German 2 4 QH

Continues LNG 1101. Emphasizes knowledge of the basic grammatical structure of German and flexibility in the four language skills. (Special sections of this course are run for business students.) *Prereq.* LNG 1101 or equiv.

LNG 1103 Intermediate German 1 4 QH

Offers a comprehensive review and reinforcement of the major aspects of German grammar and usage; continues to explore the four major skills of listening comprehension, speaking, reading, and writing; introduces the student to the reading of contemporary literary texts, including a full-length play—*Biedermann und die Brandstifter*, by the Swiss playwright Max Frisch. *Prereq.* LNG 1102 or equiv.

LNG 1104 Intermediate German 2 4 QH

Offers an opportunity to increase vocabulary as well as flexibility in the four basic language skills. Topics include grammar review, continued exposure to modern literary texts. One full-length play is read—*Der Besuch der alten Dame*, by the contemporary Swiss dramatist Friedrich Dürrenmatt. Successful completion entitles the student to choose from among the upper-level course offerings in the areas of German literature and/or composition and conversation. *Prereq.* LNG 1103 or equiv.

LNG 1107 Reading German 4 QH

Offers an opportunity to develop reading skills, disregarding other aspects of the language, such as speaking or writing. Stresses grammar necessary for reading, together with vocabulary building; scientific and nonscientific texts are read. Provides assistance to students, graduate and undergraduate, who need to pass a reading examination to fulfill specific degree requirements.

LNG 1111 Business German 1 4 QH

Provides an introduction to written German in business administration usage as found in general-purpose professional texts. Develops grammatical knowledge and competence in reading comprehension, translation, and phonetic accuracy. Considers the Federal Republic of Germany as an internationally leading economic power. Discusses weekly readings (in English) from trade publications on aspects of the German business world, including foreign and U.S. trade. Assumes no prior knowledge of German.

LNG 1201 German Composition and Conversation 1 4 QH

Strives to develop facility in speaking and writing German and stresses active use of the language.

Provides an opportunity for practice in listening comprehension through German language films or tape-recorded interviews with native German speakers; expansion of vocabulary through guided group discussions on topics of general interest; and development of language skills in areas of individual interest through preparation of oral reports in German. Includes weekly composition assignments and grammar reviews as needed. Language lab. Recommended for students preparing for co-op in Germany. *Prereq.* LNG 1104 or equiv.

LNG 1202 German Composition and Conversation 2 4 QH

Continues German LNG 1201 in content and format with emphasis on independent communication skills. Recommended for students preparing for co-op in Germany. *Prereq.* LNG 1201 or equiv.

LNG 1231 Masterpieces of German Literature 1 4 QH

Surveys the major trends in the development of German literature from the Hildebrandslied to Martin Luther. Includes reading of selected works of major authors of the twentieth century such as Hauptmann, Kafka, Mann, Brecht, Dürrenmatt, and Boll. Works read in a particular term will be based partially on theatre performances or film showings planned in the Boston area. Class attendance of these performances is anticipated. Recommended as an introductory step to literature courses LNG 1307 and above. Offered every other year, alternating with LNG 1232. *Prereq.* LNG 1104 or equiv.

LNG 1232 Masterpieces of German Literature 2 4 QH

Studies short fiction from Goethe to the present. Includes Goethe's *Die Leiden des Jungen Werthers*, ETA Hoffman's stories of fantasy and madness, Thomas Mann's *Der Tod in Venedig*, and Franz Kafka's *Die Verwandlung*, as well as stories by Böll, Grass, Christa Wolff, and others. Complements readings and lectures in German with musical and screen adaptations of the works. Recommended as an introduction to literature courses LNG 1307 and above. May be taken before LNG 1231. *Prereq.* LNG 1104 or equiv.

LNG 1309 German Literature of the Nineteenth Century 4 QH

Offers background and general survey of German literature of the nineteenth century, with particular attention to prose and lyric poetry. Includes poems of all the important romantic poets, beginning with Holderlin, Tieck, Novalis, and extending through Morike. Discusses *Novellen* by Eichendorff, Tieck, Chamisso, Kleist, Fougue, Keller, Meyer, and Ludwig. Lectures (in German) and reports. *Prereq.* LNG 1232 or equiv.

LNG 1311 German Literature of the Twentieth Century 4 QH

Considers lyric poetry and prose works of important German writers of the twentieth century, including Schnitzler, Hauptmann, Mann, and

Kafka. Lectures (in German) and reports. *Prereq.* LNG 1232 or equiv.

LNG 1801, LNG 1802, LNG 1803, 4 QH each
LNG 1804, LNG 1805 Directed Studies

Directed studies offer students a way of going beyond work given in the regular curriculum and may also serve as a means to complete major or minor requirements in certain situations. Directed studies will not be given in areas adequately covered by existing courses. Priority is given to language majors and to juniors and seniors.

Italian

Prerequisites listed for modern languages are based on current course numbers at Northeastern. Equivalent course work done elsewhere will be considered acceptable to satisfy these prerequisites.

LNI 1101 Elementary Italian 1 4 QH

For the beginner who wants instruction in the essentials of Italian grammar and the opportunity to practice speaking and reading the language.

LNI 1102 Elementary Italian 2 4 QH

Continues study of grammar and basic language skills. Practices advanced conversation and reading. *Prereq.* LNI 1101 or equiv.

LNI 1103 Intermediate Italian 1 4 QH

Reviews grammar. Offers progressively more intensive practice in oral and written communication. Selects readings from modern texts. *Prereq.* LNI 1102 or equiv.

LNI 1104 Intermediate Italian 2 4 QH

Reviews grammatical difficulties, with attention given to current idiomatic forms. Greater emphasis on self-expression. Reading of short stories or a modern novel. *Prereq.* LNI 1103 or equiv.

LNI 1201 Italian Composition and Conversation 1 4 QH

For students who have mastered the fundamentals of the language. There will be no study of grammar as such. The course aims at helping students strengthen speaking and writing ability through an analysis of the language, oral and written reports, and general discussions on a variety of topics. Conducted entirely in Italian. *Prereq.* LNI 1104 or equiv.

LNI 1202 Italian Composition and Conversation 2 4 QH

Continues LNI 1201. Stresses individual work, free discussions, and compositions. Conducted entirely in Italian. *Prereq.* LNI 1201 or equiv.

LNI 1311 Italian Literature of the 4 QH
Twentieth Century 1

Explores some of the novels, plays, and poems from a variety of literary trends and styles that evolved between the turn of the century and World War II. Studies authors such as Verga, Pascoli, D'Annunzio, Pirandello, Deledda, and Svevo. Oral and written reports. The course will be conducted

in Italian, but students may use English. Offered in alternate years. *Prereq.* LNI 1232 or equiv.

LNI 1312 Italian Literature of the 4 QH
Twentieth Century 2

Examines the postwar period to the present. Considers the many important authors since the early forties, and their books reflecting the preoccupations, moods, and aspirations of our changing times. Includes writers such as Moravia, Silone, Vittorini, Pavese, Guareschi, Buzzati, Sciascia, Ungaretti, Montale, and Quasimodo. Requires oral and written reports. English may be used, but the course will be conducted in Italian. Offered in alternate years. *Prereq.* LNI 1232 or equiv.

LNI 1801, LNI 1802, LNI 1803, 4 QH each
LNI 1804, LNI 1805 Directed Studies

Directed studies offer students a way of going beyond work given in the regular curriculum and may also serve as a means to complete major or minor requirements in certain situations. Directed studies will not be given in areas adequately covered by existing courses. Priority is given to language majors and to juniors and seniors.

Russian

Prerequisites listed for modern languages are based on current course numbers at Northeastern. Equivalent coursework done elsewhere will be considered acceptable to satisfy these prerequisites.

LNR 1101 Elementary Russian 1 4 QH

Explores the essentials of grammar, practice in pronunciation, progressive acquisition of a basic vocabulary, idiomatic expressions.

LNR 1102 Elementary Russian 2 4 QH

Continues grammar study; oral and written exercises. *Prereq.* LNR 1101.

LNR 1103 Intermediate Russian 1 4 QH

Offers further knowledge of Russian through oral and written work; the study of grammar, and reading texts of moderate difficulty. *Prereq.* LNR 1102.

LNR 1104 Intermediate Russian 2 4 QH

Continues LNR 1103. *Prereq.* LNR 1103.

LNR 1201 Russian Composition and Conversation 1 4 QH

Offers assistance in developing skills in speaking and writing by means of detailed grammar review and extensive use of audio-visual media. Conducted in Russian. *Prereq.* LNR 1104 or equiv.

LNR 1202 Russian Composition and Conversation 2 4 QH

Continues LNR 1201 with an increased emphasis on speaking the colloquial Russian idiom. Conducted in Russian. *Prereq.* LNR 1201 or equiv.

LNR 1205 Stylistics and Advanced 4 QH
Grammar Analysis 1

Designed for students pursuing a major or minor in the Russian language; focuses on modern usage

of the Russian language through newspaper and magazine articles and short stories. *Prereq.* LNR 1104 or permission of instructor.

LNR 1309 Russian Short Stories of the Nineteenth Century 4 QH

Offers detailed analysis of selected representative short stories read in Russian; study of the development of this genre. *Prereq.* LNR 1104 or equiv.

LNR 1315 Russian Expository Prose 4 QH

Selected readings of lectures, speeches, essays, and critical studies by outstanding Russian scholars. *Prereq.* LNR 1104.

LNR 1316 Russian Folklore 4 QH

Various genres of Russian folk literature are read in Russian. Readings are supplemented with lectures and tape recordings. *Prereq.* LNR 1104.

LNR 1801, LNR 1802, LNR 1803, LNR 1804, LNR 1805 Directed Studies 4 QH each

Directed studies offer students a way of going beyond work given in the regular curriculum and may also serve as a means to complete major or minor requirements in certain situations. Directed studies will not be given in areas adequately covered by existing courses. Priority is given to language majors and to juniors and seniors.

Spanish

Prerequisites listed for modern languages are based on current course numbers at Northeastern. Equivalent coursework done elsewhere may be considered acceptable to satisfy these prerequisites.

LNS 1101 Elementary Spanish 1 4 QH

Presents essentials of correct usage through acquisition of basic skills in reading, writing, speaking, and aural comprehension.

LNS 1102 Elementary Spanish 2 4 QH

Continues language instruction with increasing attention to vocabulary and skills relevant to persons who wish to become involved with the Hispanic world. *Prereq.* LNS 1101 or equiv.

LNS 1103 Intermediate Spanish 1 4 QH

Includes completion of basic grammatical usage; reading of contemporary Hispanic plays; and oral and written communication based upon assigned readings. *Prereq.* LNS 1102 or equiv.

LNS 1104 Intermediate Spanish 2 4 QH

Offers intensive reading of current topics, conversation practice utilizing skills acquired in previous coursework, and composition practice based upon varied assigned topics. *Prereq.* LNS 1103 or equiv.

LNS 1105 Conversational Spanish 1 4 QH

Emphasizes developing the ability to speak and comprehend Spanish. Particularly able students may be accepted after having completed only LNS 1103. In this case, LNS 1105 may be used to satisfy

the language requirement. *Prereq.* LNS 1104 or equiv.; open to nonmajors only.

LNS 1106 Conversational Spanish 2 4 QH

Continues LNS 1105, with further emphasis on the development of oral facility in Spanish. Particularly able students may be accepted after having completed only LNS 1104. *Prereq.* LNS 1105 or equiv.; open to nonmajors only.

LNS 1130 Intensive Spanish 8 QH

This course encompasses the same material covered in LNS 1101 and LNS 1102. Students with language-learning ability and a commitment to the study of foreign languages are encouraged to take the course. Students are expected to assimilate the material at an accelerated pace. This is a two-sequence course; students must enroll in both sequences. Satisfactory completion of this course enables the student to take LNS 1103.

LNS 1201 Spanish Composition and Conversation 1 4 QH

Offers practice in writing and speaking Spanish, including written and oral resumes, prepared speeches and themes, and impromptu speaking and writing. Reviews the more subtle problems of grammar.

LNS 1202 Spanish Composition and Conversation 2 4 QH

Offers further practice in oral and written Spanish; continues study of advanced Spanish grammar. *Prereq.* LNS 1201 or equiv.

LNS 1203 Advanced Spanish Proficiency 1 4 QH

Designed for those preparing to enter the teaching profession as well as qualified advanced students. Covers advanced elements of Spanish syntax, with emphasis upon achieving superior speaking, reading, and writing skills. *Prereq.* Permission of instructor.

LNS 1204 Advanced Spanish Proficiency 2 4 QH

Continues the aims and goals of LNS 1203. *Prereq.* LNS 1203 and permission of instructor.

LNS 1231 Masterpieces of Spanish Literature 1 4 QH

Traces the development of Spanish literature from the Middle Ages (las jarchas, *El poema del Cid*, *El libro de buen amor*, *La Celestina*) through the Renaissance and Baroque periods or Golden Age (Garcilaso de la Vega, the picaresque novel, the mystics, Cervantes, Lope de Vega, Calderon). Conducted in Spanish. (II) *Prereq.* LNS 1104 or equiv.

LNS 1232 Masterpieces of Spanish Literature 2 4 QH

Continues LNS 1231. Surveys the literature of eighteenth-, nineteenth-, and twentieth-century Spain. Includes the literary movements of romanticism, realism, and the generation of '98. Conducted in Spanish. (II) *Prereq.* LNS 1104 or equiv.

LNS 1305 Cervantes and His Times 4 QH

Examines selections from Cervantes' minor works (the *Entremeses* and the *Novelas ejemplares*); emphasis, however, is on *Don Quixote*, Spain's

greatest literary masterpiece. Conducted in Spanish. *Prereq.* LNS 1232 or equiv.

LNS 1306 Spanish Golden Age Theatre 4 QH

Examines plays by the outstanding dramatists of the seventeenth century: Lope de Vega, Calderon de la Barca, Tirso de Molina, Ruiz de Alarcon, and others. Conducted in Spanish. *Prereq.* LNS 1232 or equiv.

LNS 1309 Spanish Literature of the Nineteenth Century 1 4 QH

Covers readings in the prose, poetry, and drama of the romantic period, including selections from el Duque de Rivas, Larra, Espronceda, Zorrilla, and Becquer. Conducted in Spanish. *Prereq.* LNS 1232 or equiv.

LNS 1310 Spanish Literature of the Nineteenth Century 2 4 QH

Offers a study of some of the major novelists of the second half of the nineteenth century, such as J. M. de Pereda, Juan Valera, Emilia Pardo Bazan, and B. Perez Galdos. Conducted in Spanish. *Prereq.* LNS 1232 or equiv.

LNS 1311 Spanish Literature of the Twentieth Century 1 4 QH

Examines selections from the writings of the Generation of '98: Unamuno, Valle-Inclan, Pio Baroja, Benavente, Azorin, and the Machado brothers. *Prereq.* LNS 1232 or equiv.

LNS 1312 Spanish Literature of the Twentieth Century 2 4 QH

Focuses on prose and poetry of modern writers, such as Ortega y Gasset, Perez de Ayla, Garcia Lorca, Juan Ramon Jimenez, Gironella, and Jose Cela. *Prereq.* LNS 1232 or equiv.

LNS 1315 Latin American Literature 1 4 QH

Focuses on early Latin American literature: the literature of the colonial period and the early nineteenth century, based primarily on selections from an anthology. *Prereq.* LNS 1232 or equiv.

LNS 1316 Latin American Literature 2 4 QH

Focuses on modern Latin American literature; readings from nineteenth- and twentieth-century prose and poetry. *Prereq.* LNS 1232 or equiv.

LNS 1400 Spanish Seminar 4 QH

This course is designed primarily for majors who have progressed to the upper-level literature courses in Spanish. However, nonmajors who show exceptional background may be admitted with the instructor's permission. The course focuses upon a narrowly defined theme (that is, a single author, a single work, or a single theme), which students are asked to explore in depth; students are expected to present a final paper based upon individual research.

LNS 1401 Seminar in Spanish Literature 4 QH

This is an upper-level literature course designed primarily for majors, although nonmajors who show exceptional background in Spanish may be admitted. Students are expected to read a selected group of Galdos's novels, and the class meetings will concentrate on a detailed discussion and analysis of the works read. There are collateral readings as well, and a final paper on a topic to be selected by the student. *Prereq.* Permission of instructor.

LNS 1402 Seminar in the Contemporary Spanish Theatre 4 QH

In contrast to the bourgeois theatre of consumption in Spain, there exist a number of dramatists committed to revealing the tragic social and existential aspects of the human condition. Emphasis is placed on authors such as Vallejo, Sartre, the members of the *generacion realista*, and the "underground" playwrights. Classes are conducted in Spanish. Class participation as well as oral and written projects required. Alternates yearly with LNS 1401. *Prereq.* LNS 1232 or permission of instructor.

LNS 1801, LNS 1802, LNS 1803, LNS 1804, LNS 1805 Directed Studies 4 QH each

Offers students a way of going beyond work given in the regular curriculum; may also enable students to complete major or minor requirements in certain situations. Will not be given in areas adequately covered by existing courses. Priority given to language majors and to juniors and seniors.

Mathematics

The mathematics department offers several sequences of courses that may overlap in content. Please consult the mathematics department if you have any questions regarding course content. You will not receive credit for two courses that overlap in content.

Numbers inside parentheses within course descriptions refer to core curriculum categories, listed on page 3.

MTH 1000 Mathematics Preliminaries 1 **4 QH**

Supplies, together with MTH 1010, the high school math background necessary for a student to enroll in MTH 1101, MTH 1106, or MTH 1113. Includes the arithmetic of signed numbers, fractions, decimals, and percents; algebraic manipulation and solution of simple equations; elementary word problems; and laws of exponents. *Prereq. Permission of course coordinator.*

MTH 1010 Mathematics Preliminaries 2 **4 QH**

Supplies, together with MTH 1000, the high school math background necessary for a student to survive in MTH 1101, MTH 1106, or MTH 1113. Includes quadratic equations and systems of equations; graphing (including slope of a line and vertex of a parabola), more word problems; logarithms, trigonometry, or some of both at the instructor's discretion. (In winter and spring quarters, the material covered in MTH 1000 is assumed; in the fall quarter, there is an overlap with MTH 1000 on solving equations, word problems, and laws of exponents.)

MTH 1101 Basic Algebraic Applications **4 QH**

Examines systems of linear equations and their graphs. Focuses on graphing systems of linear inequalities in two variables with application to linear programming. Introduction to matrices, matrix multiplication, and vectors. (I) *Students do not receive credit for MTH 1101 if they have already received credit for MTH 1113.*

MTH 1103 Basic Probability **4 QH**

Covers introduction to probability, sample spaces with equiprobable events, permutations and combinations, conditional probability. Also discusses random variables, introduction to Markov processes.

MTH 1106 Fundamentals of Mathematics **4 QH**

Examines how to solve various kinds of algebraic equations: linear, quadratic, and linear systems in two and three unknowns. Considers applications to word problems such as motion, mixture, and variational problems. Covers the concept of function, graphs, line slopes, and graphs of polynomials. Also discusses some elementary trigonometry and vectors in the plane.

MTH 1107 Functions and Basic Calculus **4 QH**

Introduces differential calculus. Examines elementary rules of differentiation with application to graph sketching and to maximum and minimum problems. Discusses exponential and

logarithmic functions with applications to compound interest, population growth, and radioactive decay. (I) *Students do not receive credit for MTH 1107 if they have already received credit for MTH 1114.*

MTH 1108 Calculus **4 QH**

Offers a review and continuation of differential calculus, graphing and differentiation of trigonometric functions; also presents an introduction to integral calculus with applications to geometric problems and differential equations.

MTH 1113 College Mathematics for Business and Economics **4 QH**

Focuses on sets, rectangular coordinates and graphs, functions and functional notation, linear and quadratic functions, exponential and logarithmic functions, systems of linear equations, summations, inequalities, permutations and combinations, elementary probability concepts, arithmetic and geometric progressions, and simple and compound interest annuities. (I) *Students do not receive credit for MTH 1113 if they have already received credit for MTH 1101.*

MTH 1114 Calculus for Business and Economics **4 QH**

Focuses on matrices; Gaussian elimination inverses of matrices; systems of linear inequalities; feasible regions; graphical solution of linear programming problems; limits; derivatives; differentiation of polynomials and of exponential and logarithmic functions; maxima, minima, and points of inflection; optimization in nonlinear problems; and marginal analysis of cost revenue and profit functions. (I) *Prereq. MTH 1113 or equiv. Students do not receive credit for MTH 1114 if they have already received credit for MTH 1107.*

MTH 1120, MTH 1121 Calculus **6 QH each**

Assists students in overcoming deficiencies in precalculus mathematics without losing ground in the MTH 1123 sequence. Reviews high school algebra, introduces trigonometric functions, and covers the material in MTH 1123 and MTH 1124. Includes lecture and homework review sessions. (Students placed in this course by request or on the basis of their College Board scores and the results of an orientation-week diagnostic test.)

MTH 1123 Calculus 1 **4 QH**

Introduces the differential calculus of one variable, including trigonometric, exponential, and logarithmic functions, together with their

graphs. Includes average rates of change, instantaneous rates of change, derivatives, and the chain rule. Covers curve sketching, applications of the derivative to problems involving related rates, and maxima and minima.

MTH 1124 Calculus 2 **4 QH**

Introduces integral calculus including areas, volumes, and other applications. Studies integration involving trigonometric, inverse trigonometric, exponential, and logarithmic functions. Introduces differential equations. *Prereq.* MTH 1123.

MTH 1125 Calculus 3 **4 QH**

Studies the calculus of elementary functions in the context of complex numbers. Includes infinite series as well as second order differential equations. *Prereq.* MTH 1124.

MTH 1133 Calculus for Biology Majors 1 **4 QH**

Presents an introduction to calculus with applications to biology, ecology, and medicine. Includes differentiation, anti-differentiation, curve sketching, and exponential functions.

MTH 1134 Calculus for Biology Majors 2 **4 QH**

Continues MTH 1133. Includes exponential growth and decay; integration and area; rules for differentiation; and functions of several variables, with LaGrange multipliers, total differentials, and the method of least squares. *Prereq.* MTH 1133.

MTH 1135 Calculus for Biology Majors 3 **4 QH**

Continues MTH 1134. Includes the natural logarithm; trigonometric functions; techniques of integration, including numerical methods and differential equations, with separation of variables and qualitative methods. *Prereq.* MTH 1134.

MTH 1137 Discrete Mathematics 1 **4 QH**

Examines proof methods: induction, case analysis, contradiction; binary, octal and hexadecimal numbers; modular arithmetic; sets, relations, equivalences, functions; combinations, permutations, elementary counting, and discrete probability; and elementary graph theory. *Prereq.* MTH 1123.

MTH 1140 Calculus 1 **4 QH**

Presents introductory calculus primarily for mathematics, physics, and chemistry majors. Together with MTH 1144 and MTH 1145, includes derivatives and integrals of one-variable functions; applications to curve sketching, maxima and minima problems, area, moments, simple volumes, etc.; approximation methods, including numerical integration, root finding, Taylor series, and power series. Requires students to master the use of the computer to make value tables and plot curves and to implement simple numerical algorithms.

MTH 1141 Calculus 2 **4 QH**

Continues MTH 1140. *Prereq.* MTH 1140.

MTH 1142 Calculus 3 **4 QH**

Continues MTH 1141. *Prereq.* MTH 1141.

MTH 1150 Probability, Statistics, and the Computer **4 QH**

Presents a computer-oriented introduction to statistical methods, with applications in the social and life sciences. Examines descriptive statistics, elementary probability, correlation and regression, and the fundamentals of statistical inference (confidence intervals and hypothesis testing) with a minimum of mathematical derivations. Uses a statistical computer package such as MINITAB or SPSS to solve supplementary problems. *Prereq.* Nonmath majors.

MTH 1152 Statistical Thinking **4 QH**

Introduces the statistical style of thinking for students without mathematical sophistication or who ordinarily don't like mathematics. Assigns readings will from a wide variety of sources. Uses extensive class discussion and homework problems (some on a computer) to teach students to use statistics and to critically evaluate the use of statistics by others. Covers descriptive statistics, statistical tests, confidence intervals, regression, and sampling. (II)

MTH 1160 Introduction to Computers 1 **4 QH**

Introduces computers and considers their applications; also introduces computer programming so that the uses and limitations of computers can be discussed intelligently. Presents small programs to be written and run. Considers applications such as sorting, searching, data processing, simulation, and artificial intelligence. *Prereq.* Nonmath majors.

MTH 1163 Introduction to Computers and Computation **4 QH**

Offers an introduction to problem solving with the use of computers. Expects students to design, write, debug, and test programs in BASIC programming language. Includes application of programming to a wide variety of problems, including statistical analysis of data, plotting, artificial intelligence, and text processing.

MTH 1172 Introduction to Computer Science **4 QH**

Deals with problem solving in the context of computing. Focuses on structured programming using Pascal language. Stresses correctness, clarity, and reliability of programs. (II)

MTH 1183 Mainstreams of Mathematics **4 QH**

Traces the development of some key mathematical ideas, their historical context, and current applications. May include mathematical games and puzzles; number systems past and present; logic and computers; calculus and the rise of modern science, art, and symmetry; and cut-and-paste topology. Assumes no more than high school algebra and geometry. Encourages students with diverse backgrounds to rediscover mathematics through individual projects, supplementary readings, and classroom discussions.

MTH 1188 Problem Solving and Pre-Calculus 1 6 QH

Develops basic algebraic and problem-solving skills in students who indicate these needs and are enrolled in this course rather than the four-credit MTH 1191. Together with MTH 1189, prepares the student for calculus (MTH 1193). Includes writing equations and relating word problems to equations, plotting linear equations, word problems involving algebraic fractions, algebraic operations, radicals, inequalities, functional notation and the graphing of functions.

MTH 1189 Problem Solving and Pre-Calculus 2 6 QH

Continues MTH 1188. Includes functions and graphing, composite functions and inverse functions, logarithmic and exponential functions and equations, trigonometric functions and their graphs, solving trigonometric problems, trigonometric identities, and vectors in two-dimensions.

MTH 1191 College Algebra 4 QH

Focuses on fundamental algebraic operations, complex numbers, radicals and exponents, functions, linear and quadratic equations, irrational equations, inequalities, variation, and roots of polynomial equations. *Prereq. Mathematics placement test or MTH 4082; BET majors only.*

MTH 1192 Pre-Calculus 4 QH

Focuses on logarithms, trigonometric functions of angles in degrees and radians, trigonometric identities and equations, right triangles, oblique triangles, complex numbers in trigonometric form, systems of equations, and determinants. *Prereq. MTH 1191 or MTH 4107; BET majors only.*

MTH 1193 Calculus 1 4 QH

Focuses on plane analytic geometry; differentiation of algebraic functions; rate, motion, maximum and minimum problems; derivatives of higher order; curve sketching; basics in functions, limits, and continuity. (Not equivalent to MTH 1123.) *Prereq. MTH 1192 or MTH 4108; BET majors only.*

MTH 1194 Calculus 2 4 QH

Focuses on applications of derivatives to curve sketching; antidifferentiation; the definite integral, with applications; calculus of nonalgebraic functions — logarithmic, exponential, and trigonometric; calculus of inverse trigonometric functions; techniques of integration; indeterminate forms; and L'Hopital's rule. (Not equivalent to MTH 1124.) *Prereq. MTH 1193 or MTH 4120; BET majors only.*

MTH 1195 Calculus 3 4 QH

Focuses on polar coordinates, vectors in a plane, calculus of functions of several variables, partial differentiation, multiple integrals, infinite series, vector analysis, and introduction to differential equations. (Not equivalent to MTH 1125.) *Prereq. MTH 1194 or MTH 4121; BET majors only.*

MTH 1196 Differential Equations 4 QH

Focuses on ordinary differential equations — standard types of the first order, linear differential

equations, especially with constant coefficients; Laplace transforms; series solutions of differential equations; and Fourier series and orthogonal functions. *Prereq. MTH 1195.*

MTH 1203 History of Mathematics 4 QH

Focuses on development of the various branches of mathematics, lives of outstanding mathematicians, growth of mathematical knowledge and its relation to culture. (III)

MTH 1212 Linear Programming 4 QH

Presents an introduction to concepts and techniques of linear programming, game theory, discrete modeling (shortest path, minimum spanning tree). Explores application to economics, social sciences, and other related fields. (II) *Prereq. One year of college mathematics.*

MTH 1223 Calculus 4 4 QH

Covers partial derivatives and multiple integrals, with applications. *Prereq. MTH 1125.*

MTH 1225 Mathematical Analysis 1 4 QH

Offers a study of ordinary differential equations for engineering students. *Prereq. MTH 1223 or equivalent.*

MTH 1226 Mathematical Analysis 4 QH

Focuses on numerical methods for solving ordinary differential equations, Fourier series, and selected partial differential equations by separation of variables. (Intended primarily for engineering students.) *Prereq. MTH 1225.*

MTH 1230 Linear Algebra for Engineers 4 QH

Introduces matrices through Gaussian elimination. Proceeds to vector spaces and linear equations; orthogonality; eigenvalues and eigenvectors. Emphasizes engineering applications such as systems of ordinary differential equations. *Prereq. MTH 1225.*

MTH 1237 Discrete Mathematics 2 4 QH

Covers elementary number and group theory. Examines fields, finite fields, coding theory, Hamming and BCH codes, counting arguments. *Prereq. MTH 1137 and MTH 1223.*

MTH 1238 Combinatorial Mathematics 4 QH

Provides a transition from calculus to more traditional mathematics courses. Explores various techniques for counting, such as permutations, combinations, inclusion-exclusion, Polya enumeration, and the mathematical formulations necessary for these techniques, including elementary group theory and equivalence relations. *Prereq. Two courses in calculus.*

MTH 1243 Calculus and Linear Methods 1 4 QH

Focuses on methods of calculus and vector analysis to study curves, surfaces, and functions of several variables. Studies parameterization of lines and planes, tangents and normal vectors, partial derivatives, maxima and minima

problems, linear approximations, and tangent planes. Some linear algebra. *Prereq.* MTH 1145.

MTH 1244 Calculus and Linear Methods 2 4 QH

Continues MTH 1243. Covers multiple integration, line integrals, and exact differentials; various forms of Stoke's theorem; and more linear algebra. *Prereq.* MTH 1243.

MTH 1245 Differential Equations and Linear Methods 1 4 QH

Focuses on ordinary differential equations and linear algebra. Examines first-order equations, higher-order (primarily second-order) linear differential equations, systems of linear differential equations. Studies linear algebra, which includes eigenvalues and eigenvectors primarily for two-dimensional systems. Discusses applications of ordinary differential equations. *Prereq.* MTH 1145.

MTH 1246 Differential Equations and Linear Methods 2 4 QH

Focuses on analysis of linear partial differential equations (wave equations, heat equation, and potential equation). Covers ordinary differential equations with boundary values, Fourier analysis, and orthogonal functions. Also considers numerical methods and other topics in ordinary differential equations. *Prereq.* MTH 1245.

MTH 1301 Linear Algebra 1 4 QH

Focuses on vectors and vector spaces, including function spaces, subspaces. Examines lengths, angles, scalar products; volumes, determinants; linear independence and dependence, dimension, linear and affine maps, kernel and image. Studies algorithms: row operations, double triangular form, inversion. Introduces linear maps. Gives particular attention to characteristic polynomials, eigenvalues, and eigenvectors in low dimensions. *Prereq.* MTH 1244 or equiv.

MTH 1302 Linear Algebra 2 4 QH

Focuses on detailed study of linear maps. Studies symmetric maps and quadratic forms, isometries, skew-symmetric maps; decomposition of general linear maps using symmetric maps and isometries. Covers polynomials evaluated on linear maps, generalized eigenspaces, Jordan form. As time permits, introduces computational methods, with emphasis both on geometry underlying algorithms and on practical advantages and limitations. Surveys related areas in mathematics in which linear ideas play a role. *Prereq.* MTH 1301.

MTH 1311 Analysis 1 4 QH

Examines the theoretical foundations of calculus: limits, measure, continuity, and related concepts. With MTH 1312 serves as a bridge between the MTH 1243 through MTH 1246 calculus sequence and the more advanced analysis courses, such as MTH 1347, MTH 1348, MTH 1351, MTH 1370, and MTH 1371. *Prereq.* MTH 1246 or permission of instructor.

MTH 1312 Analysis 2 4 QH

Continues MTH 1311. Focuses on calculus, applying the concepts introduced in MTH 1311. *Prereq.* MTH 1311.

MTH 1321 Introduction to Groups and Their Applications 4 QH

Presents examples of groups (symmetry groups, permutation groups, matrix groups, cyclic groups) and their subgroups. Studies finite groups and orders of subgroups; homomorphisms and normal subgroups. Also considers applications to some of the following, depending on time and interest: geometry, number theory, crystallography, physics, and combinatorics.

MTH 1322 Topics in Rings, Fields, and Number Theory 4 QH

Focuses on algebraic properties of the integers and rational, real, and complex numbers. Also covers commutative rings, ideals, integral domains, and other quotient fields; polynomial rings; quadratic extension fields; Gaussian integers; and other topics as time permits. *Prereq.* MTH 1321.

MTH 1330 Number Theory 4 QH

Introduces the elementary methods of analytic number theory. Focuses on divisibility, congruences, arithmetical and multiplicative functions, quadratic reciprocity, and equivalent formulations of the prime number theorem. *Prereq.* MTH 1301 or permission of instructor.

MTH 1337 Foundations of Mathematics 1 4 QH

Studies the following topics and the shifts in perspective that their development brought about: the disputes over the basis for calculus, twentieth-century discoveries in mathematical logic, and the advent of the computer. (V)

MTH 1338 Foundations of Mathematics 2 4 QH

Includes set theory, rules for set formation, the axiom of choice and its role in mathematics, transfinite cardinal and ordinal numbers and arithmetic, and axiomatizations of set theory.

MTH 1347 Applied Analysis 4 QH

Demonstrates the application of mathematics to interesting physical and biological problems. Examines methods chosen from ordinary and partial differential equations, calculus of variations, Laplace transforms, singular perturbations, special functions, dimensional analysis, and other techniques of applied mathematics. *Prereq.* MTH 1246 or permission of instructor.

MTH 1349 Numerical Analysis 1 4 QH

In practice, computations are never exact. Therefore, the problem of finding efficient methods to calculate sufficiently accurate answers is of fundamental importance. The emphasis of the course is not on recipes for solving problems, proving theorems, or on writing computer programs. Rather, the practical concerns of efficiency and accuracy are illustrated by studying

the following problems: roots of a nonlinear equation, simultaneous linear equations, interpolation, and curve-fitting. *Prereq.* Two years of calculus and one course in programming.

MTH 1350 Numerical Analysis 2 4 QH

Analyzes problems in differential equations, integration, and ordinary differential equations. (Does not require prior knowledge of differential equations; MTH 1349 is not a prerequisite.)

Emphasis is similar to that of MTH 1349.

Prereq. Two years of calculus and one course in programming.

MTH 1351 Functions of a Complex Variable 1 4 QH

Focuses on algebra and geometry of complex numbers; concepts of limit, continuity, and derivative in the complex domain; holomorphic functions, series, contour integration; and applications. *Prereq.* MTH 1243 or equiv.

MTH 1352 Functions of a Complex Variable 2 4 QH

Continues MTH 1351. May include conformal mapping, analytic continuation, Riemann surfaces, the Laplace transform and inverse transform, elliptic functions, and applications. *Prereq.* MTH 1351.

MTH 1367 Geometry 4 QH

Provides a careful look at classical Euclidean geometry, Hilbert's axioms for geometry, and an extensive study of the basics of projective geometry. *Prereq.* Some basic linear algebra or permission of instructor.

MTH 1370 Recent Ideas in Geometry 4 QH

Presents some non-Euclidean geometry, especially hyperbolic and elliptic geometries. Topics include algebraic curves and surfaces. *Prereq.* MTH 1367 or permission of instructor.

MTH 1384 Probability for Engineering 4 QH

Discusses sample spaces; axioms of probability; random variables and their distributions; expectation, moments, and characteristic function; bivariate distributions; jointly Gaussian random variables; stochastic processes, including autocorrelation function and power spectral density; and estimation of the mean and autocorrelation function in the presence of noise. *Prereq.* MTH 1223 and MTH 1225 or equiv.

MTH 1387 Probability 1 4 QH

Focuses on probability functions for finite and infinite spaces; conditional probability and independence; discrete and continuous probability distributions for one or more random variables; expectation; moments; binomial, Poisson, and normal distributions; and central limit theorem. *Prereq.* MTH 1223 or MTH 1244.

MTH 1388 Probability 2 4 QH

Studies selected topics, including introduction to stochastic processes, with emphasis on Poisson processes and Markov chains. *Prereq.* MTH 1384 or MTH 1387.

MTH 1390 Mathematical Statistics 4 QH

Focuses on estimation of parameters, confidence intervals, hypothesis testing, regression, sampling distributions. Introduces analysis of variance and statistical decision theory. *Prereq.* MTH 1384 or MTH 1387.

MTH 1714, MTH 1723, MTH 1724, 4 QH each

MTH 1725, MTH 1733, MTH 1734, MTH 1735, MTH 1740, MTH 1741, MTH 1742, and

MTH 1746 Honors Program

Special sections for honors students of courses MTH 1114, MTH 1123, MTH 1124, MTH 1125, MTH 1133, MTH 1134, MTH 1135, MTH 1140, MTH 1141, MTH 1142, and MTH 1243 respectively.

MTH 1763 Introduction to Computers (Honors) 4 QH

Honors equivalent of MTH 1163.

MTH 1801–MTH 1808 Directed Study 4 QH

Gives highly motivated students the opportunity to explore mathematical situations and theories in depth. Can be used as an opportunity to examine familiar material in fresh ways or to explore new material not offered in formal courses. Provides students strong in mathematics and the related sciences a chance to develop the art and skill needed to work independently and creatively in mathematics. *Prereq.* Permission of instructor. *Students strong in mathematics are permitted to enroll in graduate mathematics courses.*

MTH 1809 Directed Study: Problem Solving 4 QH

Emphasizes mathematical problem-solving techniques from a range of areas, including but not limited to integration, differentiation, number theory, group theory, field theory, combinatorics, linear algebra, differential equations, and mathematical modeling. The mathematical model aspect constitutes one third to one half of the course. Analyzes specific realworld models in complete detail, including running and analyzing computer simulations. Requires students to make a number of presentations to the class demonstrating specific techniques. *Prereq.* Permission of instructor.

Music

Some courses in the College of Arts and Sciences are duplicated in different departments or colleges or within a department. You may not receive credit for two such courses. If you have a question about whether one course overlaps another, please consult the departments involved and the Office of the Dean before you take the course.

Numbers inside parentheses within course descriptions refer to core curriculum categories listed on page 3.

MUS 1100 Introduction to Music 4 QH

Offers an introduction to selected works of our Western musical heritage, from earliest to contemporary styles. Consists primarily of a survey and listening format, with emphasis on styles, basic theory, forms, and the historical, social, and artistic periods that these works represent. (II)

MUS 1101 Music as a Listening Experience 4 QH

This introductory course is listening-oriented and has been designed to provide tools for the aural appreciation of musical forms. No previous musical knowledge is required or assumed, and studies deal directly with compositions selected from the masterpieces of music. Organized according to the tenets of PSI (Personalized System of Instruction), the course allows students to proceed at their own pace under the constant guidance and supervision of the instructor. Grades are determined by the number of units completed. Students are expected to meet with the instructor before the beginning of the course. (II)

MUS 1102 Music in Concert 4 QH

Gives students the opportunity to develop musical understanding through the study of music currently performed in concerts by major symphony orchestras in the United States and throughout the world. Selects study materials from symphony concert programs.

MUS 1103 Music as a Social Expression 4 QH

Examines the processes of music-making and the perceptions of music's functions in our culture. Considers how music is made, what music means, what kind of music is made, and what music is made to be meaningful. Identifies styles and genres of music and examines them within an ever-shifting context of aesthetics, social history, and cultural change. (III)

MUS 1104 Survey of African-American Musics 4 QH

Explores the various musical traditions of African-Americans, with a specific focus on the United States. Examines the impact of African, European, and Native American traditions on African-American music as well as the role of music as an expression of African-American aesthetics, traditions, and life. Considers historical and contemporary forms of African-American musics, with selected video presentations of musical styles.

MUS 1105 Music of the U.S.A. 4 QH

Examines American music from the time of Puritan psalm singing to the present. Covers a wide variety of music, including concert music, traditional folk music, jazz, and contemporary styles. (V)

MUS 1106 Women in Music 4 QH

Examines the multi-faceted role of women in music from the Renaissance through to the present. Discusses the fact that for centuries women have been active and influential patrons, composers, teachers, conductors, and performers in Europe and America. Examines their contributions to classical and popular music and to jazz, with emphasis on such widely varying figures as Elizabeth Jacquet de la Guerre, Fanny Mendelssohn Hensel, Clara Schumann, Amy Beach, Germaine Tailleferre, Billie Holiday, Carla Bley, Ruth Crawford Seeger, Pauline Oliveros, Sarah Caldwell, Antonia Brico, and Nadia Boulanger.

MUS 1107 Principles of Music Literature 4 QH

Examines the evolution of each major structural element of music through a historical perspective. Also, attempts to link larger categories of music such as classical, popular, and non-Western by examining their common elements. Required of all music majors. *Prereq. Permission of instructor.*

MUS 1109 Introduction to Music and the Arts 4 QH

Offers an interdisciplinary approach to music and other arts including painting, film, and theater. Examines works of art from various periods in the context of the cultures that produced them. Supplements regular classes with visits to art museums or attendance at concerts and theatrical performances. (II)

MUS 1110 Music in Popular Culture 4 QH

Deals with the nature of music composed for the mass market. Discusses techniques of recording and merchandising music and selected songs analyzes for their musical content. Traces the evolution of various styles, including ragtime, jazz, blues, rock, and music for the media.

MUS 1111 Rock Music 4 QH

Examines the development of rock'n'roll and its relationship to blues, rhythm and blues, country, folk, and other styles of music. Considers themes

such as the role of rock as youth music, the reflections of social realities in rock songs, the relationship of rock to the recording industry and the mass media, and the changing styles of rock. Emphasizes listening skills.

MUS 1112 Jazz 4 QH

Examines the historical development of jazz music from its African-American roots to its current status as one of America's classical musics and an internationally valued art form. Devotes attention to the contributions of African musical traditions, including spirituals, work songs, and the blues. Examines the impact of major contributors such as Eubie Blake, Ma Rainey, Louis Armstrong, Duke Ellington, Charles Parker, Miles Davis, John Coltrane, and Wynton Marsalis. Examines the functional role of jazz as a means of expression in African-American culture.

MUS 1120 Topics in Music History 4 QH

Provides a chronological view of Western music, while examining the role of music in society and exploring the contributions of influential composers. Discusses representative works from each period, including music by composers such as Machaut, Josquin, Bach, Handel, Mozart, Haydn, Beethoven, Berlioz, Wagner, Mahler, and Stravinsky. (III) *Prereq.* MUS 1201.

MUS 1121 Medieval and Renaissance Music 4 QH

Offers an introduction to European music from the sixth through the sixteenth centuries. Covers a wide variety of music, ranging from the serene elegance of sacred Gregorian chant and the plaintive love songs of the medieval troubadours to the lively dances and humanistic vocal music of the Renaissance. Examines representative works by composers such as Machaut, Landini, Josquin, Palestrina, and Dowland.

MUS 1122 Music of the Baroque Era 4 QH

Focuses on music of the seventeenth and early eighteenth centuries in Italy, Germany, France, and England. Discusses the emergence of important new genres (such as opera, sonata, and concerto) and examines representative works of major composers (such as Bach, Handel, Corelli, Vivaldi, Rameau, and Purcell).

MUS 1123 Music of the Classical Era 4 QH

Focuses on crucial developments in musical styles and forms of the late eighteenth century and on emerging genres, such as the symphony, the concerto, and the string quartet. Emphasizes the vocal and instrumental works of Haydn and Mozart and on the early works of Beethoven.

MUS 1124 Music of the Romantic Era 4 QH

Focuses on romantic realism and idealism as expressed in the music of the nineteenth century. Emphasizes historical, nationalistic, and literary influences. Includes composers such as Beethoven, Schumann, Schubert, Berlioz, Liszt, Verdi, Wagner, Brahms, Tchaikovsky, and Mahler. (V)

MUS 1125 Twentieth-Century Music 4 QH

Focuses on developments in music from 1900 to the present. Examines a broad range of musical styles, including expressionism, neo-classicism, and other major trends in music of the twentieth century. (V)

MUS 1126 New Directions in Music 4 QH

Recognizes that music from 1950 to the present has changed more radically than during any other era in history. Examines new elements in classical and popular music and focuses on the relationship between the two styles.

MUS 1130 The Symphony 4 QH

Studies the symphony as a major genre in the classical, romantic, and contemporary periods. Includes works by composers such as Haydn, Mozart, Beethoven, Schumann, Tchaikovsky, Brahms, Sibelius, and Prokofiev.

MUS 1131 Piano Music: The Great Composers and Performers 4 QH

Gives students the opportunity to hear and analyze some of the greatest works for piano, performed by some of the world's greatest performers. In addition to recordings by internationally acclaimed artists, presents live performances by guest artists from the Boston area.

MUS 1132 Introduction to Opera 4 QH

Offers an analysis of opera as a dramatic genre. Isolates and discusses aria, recitative, ensemble, and other basic elements of opera. Considers number opera, music drama, and Singspiel types of opera. Includes composers such as Mozart, Wagner, Verdi, and Puccini.

MUS 1133 Great Choral Literature 4 QH

Analyzes sacred and secular choral literature from medieval to contemporary times.

MUS 1134 Music and Poetry 4 QH

Examines the art of setting words to music. Confronts the aesthetic problems encountered in a synthesis of two different art forms. Examines that synthesis in selected songs, choral works, tone poems, and operas of diverse periods and styles (classical, folk, and popular). (III)

MUS 1139 Film Music 4 QH

Surveys the use of music in film and video and gives an overview of the mechanics of synchronization and the psychological implications of applying music to film. Analyzes specific dramatic situations, followed by discussion of such scoring techniques as click tracks and picture recording. Studies films such as *The Informer*, *Alexander Nevsky*, *Citizen Kane*, *Forbidden Planet*, *Woman in the Dunes*, and *Tron*. Discusses the works and careers of specific film composers such as David Raskin, Aaron Copland, Jerry Goldsmith, Sergei Prokofiev, and John Williams.

MUS 1140 Mozart 4 QH

Traces Mozart's musical development from child prodigy to mature artist through personal letters and biographies. Analyzes many of his major compositions, including symphonies, concertos, operas, and chamber works.

MUS 1144 Debussy and the Music of Paris 4 QH

Recognizes that Claude Debussy, impressionist in sound, composed music that marked a turning point toward modern trends. Covers much of his music for piano, orchestra, and voice, including *Suite Pour le Piano*, *Suite Bergamasque*, *Images* (for piano and orchestra), *Nocturnes*, *La Mer*, and *Pelleas et Melisande*. Discusses the music of Satie, Ravel, and Fauré as it relates to that of Debussy.

MUS 1145 Beethoven 4 QH

Analyzes the complex personality and art of Beethoven, his relation to the turbulent times in which he lived, and his role in classical and romantic music. (III)

MUS 1146 George Gershwin 4 QH

Studies the life and works of George Gershwin (1898–1937), including popular song, musical comedy, opera, and orchestral compositions. Explores the relationship of George Gershwin to his times, both musically and historically. Takes as a critical starting point Gershwin's famous statement, "My people are American; my time is today."

MUS 1161 Music Therapy 1 4 QH

Examines the application of music as a therapeutic vehicle to release suppressed emotions, to encourage self-expression in psychiatric patients, and to treat a wide variety of disorders. Examines music therapy, in a modern approach to health services, as a supplement to other treatments.

MUS 1162 Music Therapy 2 4 QH

Examines the etiologies, characteristics, and applications of music therapy with the physically handicapped, hearing impaired, visually impaired, learning disabled, emotionally disturbed, speech/language impaired, and geriatric populations in one-to-one and group settings. In addition, studies improvisations and appropriate music materials for the nonmusician and adapted instrument designs tailored to each disability, while exploring the correlation of music and movement. Compares various musical therapy approaches; includes field trips to musical therapy sites in and around Boston. *Prereq.* MUS 1161.

MUS 1163 Sound Health 4 QH

Gives both musicians and non-musicians the opportunity to experience a heightened awareness of the power of music to effect physical and emotional change. Examines the effects of music on the body, mind, and spirit. Begins with an exploration into the awareness of sound and the physiological changes in the body caused by music,

and moves through a variety of theories and techniques used to facilitate positive change, relaxation, and reduction of stress. Also considers sound pollution, the effects of vibrations on the body, guided imagery, music and meditation, and new-age environmental music.

MUS 1165 The Music Industry 1 4 QH

Examines business-related areas of the music industry. Includes topics such as the make-up and structure of the record industry and music publishing world, the function of performing rights organizations (ASCAP and BMI), and the role of concert and orchestral managers. Includes guests from the various fields who will be invited to lecture in class and trips to "behind the scenes" locations.

MUS 1166 The Music Industry 2 4 QH

Continues MUS 1165. Covers such topics as artist management, theatrical production, concert promotion, and royalties and contracts. Requires students to undertake case studies of local musical organizations, both on and off campus.

MUS 1167 Music Management 4 QH

Introduces music management, including the structure of nonprofit organizations (such as arts service organizations, arts centers, symphony orchestras, chamber orchestras, ensembles, opera companies, and university arts programs) and the structure of profit enterprises. Examines financial management, funding, and audience development.

MUS 1170 Music and Technology 4 QH

Studies the applications of contemporary technology to music. Discusses basic acoustics, analog and digital recording techniques, computer sound synthesis, and the aesthetics of electronic music. Requires no prerequisites in physics or music theory; however, takes into consideration the particular backgrounds of individual students for projects and papers.

MUS 1172 Introduction to Music Recording 4 QH

Introduces the history and practice of recording music. Covers recording apparatus; microphones; monophonic, stereophonic, and digital theory and techniques; field recording; studio terminology; basic sound theory; and development of rudimentary editing skills. Also examines the role of the producer versus that of the technician, preparation for recording sessions, and basic legal regulations regarding copyrights and compensation.

MUS 1173 Music Recording 2 4 QH

Offers the opportunity to learn additional skills in the recording process such as material marketing and distribution, contracts and negotiations, and establishing distribution channels. Includes hands-on studio production of record-quality material. *Prereq.* MUS 1172.

MUS 1180 Introduction to World Music 4 QH

Introduces musical traditions from around the world using ethnomusicological approaches to examine the role of music in culture. Focuses on various world musics from the perspectives of the people who create the music and compares these perspectives with our own.

MUS 1181 Musics of Africa 4 QH

The musics of Africa are as varied as that continent's many linguistic and cultural groups. The course surveys various African musical traditions with respect to their historical, social, and cultural heritage. The course examines traditional and contemporary African musics, instruments, and performance traditions.

MUS 1182 Music of the Middle East 4 QH

Presents an introduction to the music of selected Near Eastern and Arab cultures (such as Persian in the East and Ethiopic and Berber in Africa). Includes the cantillation styles and practices of various chants of the Hebrew, Christian, and Islamic traditions.

MUS 1183 Music of East Asia 4 QH

Introduces the student to the musical heritage of East Asia by examining music history, the relationship of music cultures to each other, the organization of musical sounds, and music as an aspect of culture. Emphasizes development of basic listening skills.

MUS 1184 Music of Latin America and the Caribbean 4 QH

Examines the highly diverse and unique musical practices of Latin America and the Caribbean. Emphasizes music's role as an adjunct to religious and social practices, as well as how it has been influenced by European, Native American, and African music.

MUS 1200 Fundamentals of Music 4 QH

Provides basic instruction for those who want to learn how to read music or how to write a tune. Gives students the opportunity to learn to sight-read music and to compose in some of the basic forms (song, theme and variation, etc.).

MUS 1201 Music Theory I 4 QH

Offers the student the opportunity to learn simple melodic and rhythmic dictation skills; to recognize and build scales, intervals, and triads; and to sing at sight simple tonal melodies. Requires a noncredit, ear-training lab. (II)

MUS 1202 Music Theory 2 4 QH

Focuses on harmonic practices in tonal music. Examines the role and function of harmony through analysis of musical examples and composition of four-voice chorales. Requires a noncredit, ear-training lab. *Prereq.* MUS 1201.

MUS 1203 Music Theory 3 4 QH

Continues MUS 1202 and focuses on aspects of chromatic harmony. Discusses the construction and function of borrowed chords, altered chords,

and non-diatonic harmony. Requires a noncredit, ear-training lab. *Prereq.* MUS 1202.

MUS 1204 Music Theory 4 4 QH

Introduces the student to methods of musical analysis. Examines phrasing, periodicity, tension-repose, and other structural factors of musical compositions. Requires a noncredit, ear-training lab. *Prereq.* MUS 1203.

MUS 1209 Functional Piano 4 QH

Gives students the opportunity to develop the keyboard skills appropriate for an undergraduate concentration in music. Studies realization of a figured bass, the harmonization of a melodic line, simple score reading (including treble, bass, alto, and tenor clefs), transposition, sight-reading, and the ability to play any of the major or minor scales. *Prereq.* MUS 1202.

MUS 1210 Music Theory Lab 1 QH

Provides both group and individual instruction in ear training, sight-singing, and keyboard skills. This lab can be taken only in conjunction with the department's music theory courses (MUS 1201, MUS 1203, MUS 1204). May be repeated for credit.

MUS 1211 Sight-singing 4 QH

Offers students the opportunity to learn how to read music at sight without the aid of a musical instrument, an essential skill for every musician. Emphasizes mastery of the skills of rhythm reading, as well as solfège and triad recognition in all diatonic keys, through class instruction and daily practice. Requires knowledge of the fundamentals of musical notation. *Prereq.* MUS 1201 or equivalent.

MUS 1230 Chorus 1 QH

Allows students to participate as performers in one or more ensembles under the direction of a faculty conductor. May be repeated for credit. *Prereq.* Permission of instructor.

MUS 1231 Band 1 QH

Allows students to participate as performers in one or more ensembles under the direction of a faculty conductor. May be repeated for credit. *Prereq.* Permission of instructor.

MUS 1232 Chamber Ensembles and Orchestra 1 QH

Allows students to participate as performers in one or more ensembles under the direction of a faculty conductor. May be repeated for credit. *Prereq.* Permission of instructor.

MUS 1233 Early Music Players 1 QH

Allows students to participate as performers in one or more ensembles under the direction of a faculty coach. May be repeated for credit. *Prereq.* Permission of instructor.

MUS 1241 Piano Class 1 4 QH

Provides introductory-level study of piano designed for students with or without previous

experience. Combines skills in reading music with improvisation and functional piano. Introduces some basic theory to help clarify the structure of class repertoire. Allows students to progress at their own pace. Determines grades by the amount of repertoire mastered during the quarter.

MUS 1242 Piano Class 2 **4 QH**

Continues the skills developed in MUS 1241, with emphasis on increasing students' flexibility at the keyboard through the study of scales, transposition, and modulation. *Prereq.* MUS 1241.

MUS 1244 Voice Class 1 **4 QH**

Gives students the opportunity to learn the basic vocal production required for fine singing. Chooses repertoire, both classical and contemporary, for each student to learn and perform in lessons and before the entire class. Covers the following subjects: diction, the physiology of singing, resonance, registers, and interpretation. Also studies the basics of music reading and sight-singing. Discusses some interpretation and plays recordings of the greatest vocal artists for class analysis. *Prereq.* Permission of instructor.

MUS 1247 Guitar Class 1 **4 QH**

Provides an introduction to the fundamentals of classical guitar playing for those with or without prior knowledge of the guitar. Covers music reading and theory. Requires students to perform alone and in ensemble with other members of the class. Augments the syllabus by live performances from outside professional and student classical guitarists. Bases final grades on several written examinations and student performance.

MUS 1250 Conducting **4 QH**

Provides instruction in the basic gestures used in conducting vocal and instrumental ensembles. Topics include beat patterns, conveying phrasing and articulation, cueing, controlling tempo and dynamics, score study, and rehearsal techniques. Provides an opportunity for students enrolled in the course to constitute a laboratory ensemble for regular practicum. *Prereq.* Ability to read music and to sing or play an instrument.

MUS 1261 Music Lessons **1 QH**

Offers private instruction in voice or in an instrument. Arranges lessons on a half-hour or 45-minute basis. Contact the music department for arrangements. Lab fee.

MUS 1265 Jazz Improvisation 1 **4 QH**

Focuses on repertoire as well as performance. Examines the great improvisational artists in American music, such as Charlie Parker, Miles Davis, and John Coltrane. Approaches analysis from a theoretical as well as a practical perspective. Explores the use of rhythm, chords, scales, and modes in the creative improvisation process.

MUS 1301 Form and Analysis 1 **4 QH**

Examines representative examples of structural principles governing the melodic, harmonic, rhythmic, and formal components of music. Focuses on music from the sixteenth to the mid-nineteenth centuries. *Prereq.* MUS 1204.

MUS 1302 Form and Analysis 2 **4 QH**

Continues MUS 1301. Examines works from the late nineteenth century to the present. Includes selected readings by prominent twentieth-century theorists. *Prereq.* MUS 1301.

MUS 1461 Applied Music Lessons **3 QH**

Provides advanced individual instruction in voice or on modern and early instruments. May be repeated for credit. Available only to upperclass students concentrating in music literature and performance. *Prereq.* Permission of instructor and department chair.

MUS 1700 Introduction to Music (Honors) **4 QH**

Honors equivalent of MUS 1100.

MUS 1709 Introduction to Music and the Arts (Honors) **4 QH**

Honors equivalent of MUS 1109.

MUS 1800, MUS 1801, MUS 1802, MUS 1803, MUS 1804, MUS 1805 Directed Study **4 QH each**

Focuses independent work in a selected area of music under the direction of one member of the department. Limits enrollment to qualified students by special arrangement with the supervising faculty member and with the approval of the department chair.

Courses at the New England Conservatory

A limited number of qualified students will be able to take selected courses at the New England Conservatory of Music. Regular academic credit will be granted. For information, contact the chair of the department.

Philosophy and Religion

Some courses in the College of Arts and Sciences are duplicated in different departments or colleges or within a department. You may not receive credit for two such courses. If you have a question about whether one course overlaps another, please consult the departments involved and the Office of the Dean before taking the course.

Numbers inside parentheses within course descriptions refer to core curriculum categories listed on page 3.

PHL 1100 Introduction to Philosophy 4 QH

Introduces students to philosophy by acquainting them with the theories and arguments of classical and contemporary philosophers and by teaching the skills of constructing and analyzing arguments. Emphasizes philosophical inquiry. Covers typical areas such as questions about the basis of morality, free will versus determinism, the existence of God, the problem of suffering, and the nature of knowledge. (II)

PHL 1110 Introduction to Religion 4 QH

Seeks to identify and appraise different ways of being religious: primitive, mystical, dogmatic, and ritual. Emphasizes appreciating the unique standpoint that each requires, how each sees the world in a radically different way, and how that leads to distinctive ways of life. (II)

PHL 1130 Ethics: East and West 4 QH

Is there a best way to live? Is there a way a human being should live? In both Eastern and Western philosophy there are claims that a way of life exists that leads to happiness, power, and wisdom. This course explores this claim by studying the thought of such philosophers as Socrates, Buddha, Plato, Aristotle, Lao Tzu, Epictetus, Marcus Aurelius, Aquinas, and Spinoza, as well as by studying some of the classical Hindu and Buddhist texts. (V)

PHL 1135 Philosophical Problems of Law and Justice 4 QH

Focuses on two general questions: What is the proper scope of the law? And how should the law be enforced? Under the first question, deals with a number of issues such as whether the law has a legitimate right to restrict such activities as the use of drugs, deviant sexual practices, or gambling. Under the second question deals with the justification of punishment, rehabilitation as an alternative to punishment, and the death penalty. (VI)

PHL 1140 Social and Political Philosophy 4 QH

Focuses on basic questions about the nature of the state and the relationship of individuals to the state. What basis is there for individuals to obey the laws of the state? What conditions must a government meet to be legitimate? What justification can be given for democratic forms of government? What sorts of controls should the state exert over citizens? What benefits do citizens have a right to expect from the state? Includes readings from both classical and contemporary sources. (V)

Prereq. 4 QH philosophy.

PHL 1145 Technology and Human Values 4 QH

Examines the changing values of the modern, technologically advanced world. Attempts to increase our understanding of the supposed breach between the literary and scientific cultures, the diverse approaches toward their reconciliation, and the human dimensions of science and technology. Considers other relevant topics such as the neutrality of technology with respect to good or evil uses, technology as an instrument for human liberation, and the issue of proper and effective modes of controlling technology in today's world. Studies Pirsig's widely read paperback, *Zen and the Art of Motorcycle Maintenance*, as well as Lynn White's *Dynamo and Virgin Reconsidered*. Also considers other important writers, including Kurt Baler, Jacob Bronowski, Barry Commoner, Erich Fromm, Karl Marx, and C. P. Snow. (VI)

PHL 1155 The Ethics of Human and Animal Experimentation 4 QH

Explores the conflicts that arise between the value of free scientific inquiry on the one hand and the rights, vulnerabilities, and suffering of human and animal subjects on the other. Considers traditional issues involving informed consent, voluntariness, coercion, experimental design, risk-benefit analyses, institutional review boards, and professional guidelines, as well as such less traditional issues as the competing conceptions of progress, whether we have obligations to nonhuman animals, and what, if anything, justifies us in treating animals in ways in which we know we should not treat humans. (VI)

PHL 1160 Ethical Issues of Taxation 4 QH

Although we tend to believe that persons have a right to their own labor, a right to their own property, and a right to exchange their labor or property for the labor or property of other consenting adults, it seems that income taxes, property taxes, and sales taxes violate these rights. This course explores two basic questions: Is any taxation morally justified? Are there moral grounds for choosing among taxation policies? Specific topics include competing conceptions of private property; the "progressive versus regressive taxation" controversy; the "flat tax" controversy; the alleged problems with interpersonal utility comparisons; and questions involving the

distribution of tax monies, e.g., whether those who have more than they need have any moral obligation to provide for the needs of the poor. (VI)

PHL 1165 Moral Problems in Medicine **4 QH**

Examines two fundamental ethical systems, one of which is grounded on the dignity of the person, the other on the intrinsic value of happiness. Then explores the difficult issues of euthanasia, suicide, paternalism, medical experimentation, the patient's right to consent to any therapeutic intervention, and the concept of death with dignity. Examines the larger economic and policy issues of justice, some of which are current in political debates (for example: Is there a right to health care?). Encourages the student to become more sensitive to moral problems as they arise in medical settings, to be better able to deal with these troublesome issues, and perhaps to be more courageous in facing them if that becomes necessary. Also offers an investigation into the questions of abortion, euthanasia, infanticide, genetic counseling, psychosurgery, and human experimentation from the standpoint of both philosophical ethics (such as the theory of the end justifying the means) and religious ethics (such as the natural-law theory of the Roman Catholic Church). (VI)

PHL 1180 Ecology Ethics **4 QH**

Investigates the Gaia hypothesis, the view that the earth is a self-regulating ecosystem. Focuses on a current ecological crisis, the greenhouse effect, and on one of its major causes, deforestation. Addresses the values that underlie our concern over this and other ecological crises, whether the values at issue are anthropocentric or biocentric. Explores the ethical implications these ecological concerns have for our individual lifestyles, and for our role as members of communities. Explores how we should live as creative, responsible, and fulfilled beings on the planet. (VI)

PHL 1200 Introduction to Logic 1* **4 QH**

Introduces the logic of propositions and the syllogism. Examines principles of critical reasoning and fallacies. Provides practice in applying logical techniques to the creation and criticism of argument. (II)

PHL 1203 Introduction to Logic 2* **4 QH**

Further studies the techniques of logic in the analysis and creation of argument. Explores the logic of predicates, quantifiers, and relations. Provides practice in applying these techniques to natural arguments. Considers the forms of definition and the evaluation of empirical generalizations. (Overlaps PHL 1215.) (II)

PHL 1215 Symbolic Logic* **4 QH**

Focuses on the syntax and semantics of propositional logic and first order quantification theory.

*Students should take either PHL 1200 and PHL 1203 or PHL 1200 and PHL 1215. Credit will not be given for all three courses.

Considers relations between these systems and natural language. Covers analysis of the notion of derivation within a system, the notion of logical consequence, and practice in analyzing logical structure in natural language sentences. (II)

PHL 1225 Ancient Philosophy **4 QH**

Explores classical Greek philosophy; starts with a study/discussion of the roots of Western thought in the sixth century B.C. and argues the reasons for our debt to these original thinkers who were concerned with explaining the principles of external nature and the problems of human knowledge and conduct. Studies Socrates and his adversaries, the Sophists, and the two major figures he influenced: Plato and Aristotle. Also covers Roman philosophy, the Stoics, and the Sceptics, who are a prelude to the early Christian philosophers of the first century A.D. Places attention on the interplay between philosophers and the moral, social, and religious context in which their thought arises. Emphasizes student participation in class discussion. (III)

PHL 1230 Modern Philosophy **4 QH**

The 100 years between 1650 and 1750, sometimes called "the century of genius," were a period in which philosophers reacted to the new scientific discoveries of Copernicus, Kepler, and Galileo. Out of this reaction came new ways of thinking about the nature of knowledge and the nature of the world itself. The course focuses on the development of the rationalist and empirical philosophies during this period, with emphasis on Descartes, Leibniz, Spinoza, Locke, Berkeley, and Hume. (III) *Prereq.* 8 QH philosophy.

PHL 1243 Existentialism **4 QH**

Examines existentialist philosophy in its greatest representatives, such as Kierkegaard, Nietzsche, Dostoevski, Heidegger, Jaspers, and Camus, with major attention given to Jean-Paul Sartre and Maurice Merleau-Ponty. Focuses on central themes, including self-alienation, unauthenticity, authenticity, and existential experiences. Examines existential philosophy in its historical, social, and cultural relations, and in its influence on psychology, psychoanalysis, sociology, political science, and literature, both in Europe and in the United States. *Prereq.* 4 QH philosophy.

PHL 1245 Analytic Philosophy **4 QH**

Traces the development of the analytic movement from its beginnings in the early works of Moore and Russell. Provides some treatment of Russell's logical atomism, the logical positivists, the thought of Ludwig Wittgenstein, and their widespread influence. *Prereq.* 8 QH philosophy.

PHL 1250 Chinese Philosophy **4 QH**

Examines Chinese philosophy in the ancient period (until 221 B.C.). Emphasizes Confucianism, Taoism, and the *I Ching*. Also covers the Logicians, the Mohists, and the Legalists.

PHL 1255 Indian Philosophy**4 QH**

Examines the two classical Indian philosophical systems of Hinduism and Buddhism. In examining Theravada Buddhism, explores the view that it is possible for us to live without anxiety or suffering if we overcome our ignorance of reality and master our desires. Next, explores Mahayana Buddhism and its ethics of compassion and its related metaphysics of "voidness." In this part of the course, examines questions that, in the West, are thought of as questions about personal identity and the nature of the self. In exploring Hinduism, studies Vedic mysticism as it comes to us through the Upanishads, as well as the influential ethics of the Bhagavad Gita. Examines the question of whether the method of yoga and meditation is a reasonable method for learning about the fundamental nature of reality.

PHL 1275 Eastern Religions**4 QH**

Eastern religions appear to be fundamentally different from the orthodox religions of the West. Not only do Hinduism, Buddhism, and Taoism promise a solution to the problem of suffering (compare the common Christian and Jewish attitudes), but most of these religions do not have a central God personality, and some explicitly reject such a concept as meaningless or at least as irrelevant to leading a religious life. Central to these views is a way of being in the world that emphasizes meditation, skillful and compassionate action, and a direct awareness of the fundamental nature of reality. The course first tries to make sense of the difficult notion that the way we perceive reality may be illusory. It then examines Theravada Buddhism, a religion that rests on the insights that everything is impermanent and that it is possible to live fully in the present without any suffering. From Theravada Buddhism, the course turns to Mahayana Buddhism, and then to Taoism, a subtle view that emphasizes the "flow" of life and that "the way to do is to be." Next, the Hinduism of the Upanishads is examined. As part of the exploration of this form of Hinduism, students are given the opportunity to examine meditation intellectually and also to practice a few methods of meditation. In addition, the course investigates the devotional aspect of Hinduism as expressed in the Bhagavad Gita. There will also be an exploration of Zen. (IV)

PHL 1280 Islam**4 QH**

Explores the history of Islam, its past and current conflicts with the West, Islamic beliefs, the future of Islam as a world religion, and relations of Islam with Christianity and Judaism. Examines social, political, and legal issues, as well as with the more familiar religious and theological questions. (IV)

PHL 1290 Cults and Sects**4 QH**

Examines the varieties of religious experience from the perspectives of sociology and psychology of religion. Focuses on such cultic and sectarian groups as Christian Science, the American

Shakers, the Unification Church, the Hare Krishna movement, and the Black Muslims. Provides the student the opportunity to acquire critical investigative tools with which to analyze different religious expressions.

PHL 1295 Medicine, Religion, and the Healers' Art**4 QH**

Explores aspects of the historical, religious, and cultural context for contemporary alternatives in health care, beginning with an examination of several examples of traditional healing practices and their accompanying religious and philosophical views about human life. Explores this "holistic" tradition in two frames of reference: the ascendancy of scientific rationalism over religion and the takeover, by male-dominated professions, of healing functions that society has traditionally assigned to women (e.g., the rise of obstetrics and the suppression of midwifery). Gives special attention to major women healers of the nineteenth century. Looks at some contemporary efforts at reintegration of scientific and traditional values in the modern health care system. Gives students the opportunity to meet and interact with patients and healers active in the modern holistic health movement.

PHL 1315 Understanding the Bible**4 QH**

Introduces students to the Old and New Testaments, so that they can enter into a dialogue with the Bible, understanding not only what it says, but why it is said that way. Focuses on the Bible's social, political, and cultural backgrounds. (III)

PHL 1320 The Meaning of Death**4 QH**

Offers an inquiry into different philosophical and religious perspectives on death and life after death, including an examination of some powerful contemporary accounts of personal confrontation with death, along with investigations into attitudes toward death in other traditions for example, Hinduism and Buddhism. In addition, explores responses to the Holocaust in Europe and theories about life after death (such as those discussed in Raymond Moody's *Life After Life* and Ian Stevenson's *Reincarnation*). (V)

PHL 1325 Philosophy of Death, Grief, and Dying**4 QH**

Explores fears about death and dying and the grieving process and examines the processes people sometimes experience while dying. In addition, examines current practices of caring for the dying and of coping with bereavement, questioning whether these practices are healthy, helpful, and/or ethical. Examines other relevant ethical issues, including euthanasia, truth-telling with the dying, suicide, and paternalism. Closes with the question of the meaning of life, given the fact that we must die.

PHL 1335 Moral Philosophy**4 QH**

Explores two basic questions: What sorts of things are good and bad? What actions are right and wrong? Covers major classical conceptions of

ancient Greece and Rome, their replacement by the Western religious ethic, its modification and rejection in the early modern period, and the emergence of modern versions of traditional conceptions of the good life, with reflections on the nature of ethical inquiry itself as a legitimate study. *Prereq.* 4 QH *philosophy or religion or permission of instructor.*

PHL 1340 Aesthetics 4 QH

Offers a historical approach to aesthetics, the philosophical analysis of concepts and the solution of problems that arise when one contemplates beautiful (or ugly) objects. Also explores standards of value in judging art by asking the following questions: What features make objects beautiful (or ugly)? Are there aesthetic standards? What is the relation of works of art to nature? What is the nature of an aesthetic experience? *Prereq.* 4 QH *philosophy.*

PHL 1345 Philosophy of Religion 4 QH

Asks the basic question "Does God exist?" Examines several major arguments affirming and criticizing the notion of God's existence. Explores a central problem in recent philosophy of religion of whether or not it makes any sense to speak of the truth (or falsity) of religious belief, as well as the implication an answer to that issue has for religious life. *Prereq.* 4 QH *philosophy.*

PHL 1350 Philosophy of Human Nature 4 QH

Offers a philosophical inquiry into the theories of man, man's dimensions, and human nature. Examines the question of the existence of human nature. Pays special attention to contemporary theories of man and self-alienation and their influence in social sciences. Includes selected readings from Descartes, Hobbes, Hegel, Marx, Kierkegaard, Maritain, Freud, Skinner, Fromm, and Frankl.

PHL 1360 Philosophy and Literature 4 QH

Provides the student the opportunity to learn to recognize, appreciate, and criticize philosophical themes in literature. Includes readings from acknowledged classics by philosophical authors such as Voltaire, Dostoevski, and Sartre; popular contemporary authors such as Vonnegut, Barth, and Pynchon; and readings from more straightforward philosophical sources. Examines the meaning of life, the human condition, depersonalization, alienation, human freedom, questions of value, responsibility, rationality, and personal identity. Explores religious, nihilistic, existential, and other viewpoints.

PHL 1370 The Meaning of Life 4 QH

Examines selected philosophical problems of human existence in the contemporary world, with major emphasis on the search for identity and self-fulfillment. Discusses selected problems such as freedom, death, sexuality, alienation, becoming a person, and peak experiences. Includes readings

from Kierkegaard, Heidegger, Sartre, Camus, Maslow, Allport, Frankl, Rogers, and Rollo May.

PHL 1375 Freud, Skinner, and Their Critics 4 QH

Examines fundamental themes and concepts of Freud's psychoanalysis and Skinner's psychology from a philosophical perspective and criticisms of them from the point of view of reformed Freudians and existentialists. Includes selections from Freud, Jung, Adler, Karen Horney, Skinner, Koestler, Pearls, Sartre, Merleau-Ponty, and Kovaly. *Prereq.* 4 QH *philosophy or permission of instructor.*

PHL 1400 Theory of Knowledge 4 QH

Introduces epistemology, or theory of knowledge, which asks the following questions: What is knowledge? Is knowledge (or even certainty) attainable? What are the limitations of human knowledge? How is knowledge—if we have it—acquired? What roles do reason and experience play in the attempt to attain knowledge? Studies both classical (Rene Descartes and David Hume) and contemporary sources (Bertrand Russell and others). Examines and criticizes various theories of knowledge, such as empiricism, rationalism, and scepticism. Encourages students to form at least tentative opinions on these issues. *Prereq.* 4 QH *philosophy or permission of instructor.*

PHL 1405 Metaphysics 4 QH

Considers central problems and theories concerning the nature of reality, with special attention to such areas as the relation between mind and matter, free will and determinism, and criteria of existence. *Prereq.* 8 QH *philosophy.*

PHL 1410 Philosophy of Science 4 QH

Focuses on the nature of scientific method, scientific theories, and scientific explanations. Examines the central question of why science is thought to provide the most reliable account of the nature of reality. Considers various theories about the nature and reliability of science. *Prereq.* 4 QH *philosophy.*

PHL 1415 Advanced Logic 4 QH

Studies the major results in the meta-theory of first order logic. Examines consistency, completeness, and decidability. Discusses the general notion of an effectively computable process, Church's thesis, and the existence of unsolvable problems. *Prereq.* PHL 1215.

PHL 1435 Philosophy of Mind 4 QH

Seeks to show what puzzles and problems result from an honest attempt to answer these questions in a reasonable way: What is the relation between mind and body? Is the mental merely a function of bodily process and behavior, or does it somehow exist "over and above" the material? How are self-knowledge and knowledge of other minds achieved? What is the relation between words and thoughts? Examines classical sources, such as Descartes and Locke, and contemporary sources,

such as Wittgenstein and Putnam. Also seeks to arrive at some answers—however tentative or provisional—to these questions. Constantly challenges the student to think and write well about these difficult subjects. *Prereq.* 4 QH philosophy.

PHL 1440 Philosophy of Language 4 QH

Examines prospects for a theory of language, its syntax, and its semantics. Examines contrasts between theory of reference and theory of meaning. Asks whether there are universals of language? Analyzes relations between linguistics and psychology. Includes readings from Frege, Quine, Russell, Chomsky, and Fodor. *Prereq.* Permission of instructor.

PHL 1550, PHL 1551, PHL 1552 4 QH each
Honors 1, 2, and 3

Students interested in taking junior/senior honors courses should confer with the department chair. Arrangements are made between the student and a member of the faculty. Staffing is by arrangement.

PHL 1700 Introduction to Philosophy (Honors) 4 QH

Honors equivalent of PHL 1100.

PHL 1740 Social and Political Philosophy (Honors) 4 QH

Honors equivalent of PHL 1140.

PHL 1800 Directed Studies 4 QH

Those interested in the directed studies program should meet with the department chair. *Prereq.* By arrangement between student and faculty.

PHL 1888 Great Philosophers Seminar 4 QH

Focuses on the writings of a major philosopher. Subjects include Plato, Aquinas, Locke, Hegel, and Heidegger. *Prereq.* 12 QH of philosophy courses.

PHIL 1890 Seminar in Religion 4 QH

Examines topics including theodicy, cosmogeny, contemporary issues in religion, and comparative ethics. *Prereq.* 12 QH of philosophy and religion courses.

PHL 1891 Major Figures in Religious Studies 4 QH

Focuses on the work of one figure important in the field of religion. Subjects include Augustine, Calvin, Luther, Weber, and Eliade. *Prereq.* 12 QH of religious studies.

PHL 3265 Issues in Medical Ethics 4 QH

Focuses on issues in medical ethics, especially as they are likely to arise in a clinical setting. Begins with exploration of the two basic systems of ethical theory and then concentrates on their application in cases exemplifying the issues of euthanasia, paternalism, experimentation, informed consent, quality of life, professional responsibility, right to health care, truth telling, genetic control, abortion, and the allocation of scarce medical resources. *Prereq.* Permission of instructor.

Physics

Some courses in the College of Arts and Sciences are duplicated in different departments or colleges or within a department. You may not receive credit for two such courses. If you have a question about whether one course overlaps another, please consult the departments involved and the Office of the Dean before taking the course.

Numbers inside parentheses within course descriptions refer to core curriculum categories listed on page 3.

Courses are listed according to level and degree of specialization. General interest courses have no prerequisites and may be used to satisfy College of Arts and Sciences distribution requirements in science. Introductory physics courses are basic first-year physics lecture courses; the corresponding labs are listed under "Introductory Physics Laboratories." Advanced physics and astronomy courses require one year of introductory physics and may be used to satisfy degree requirements for physics majors.

General Interest Courses

PHY 1111 Introduction to Astronomy I 4 QH

The first of a two-quarter sequence, offers the nonscience student an introduction to modern astronomical ideas. Includes such topics as introduction to the cosmos; tools of the astronomer (atoms, the nature of light and radiation, telescopes, space astronomy); the earth in space; our solar system (origin and future of the solar system, the planets and other bodies, the latest from spacecraft flights, the sun as our bridge to the stars); the question of life in the universe. (II)

PHY 1121 Introduction to Science I 4 QH

With PHY 1122, forms a two-quarter sequence for nonscience majors that provides an interdisciplinary treatment of the basic ideas of the natural sciences. Discusses concepts such as energy, gravity, and the atom, followed by a consideration of the ways in which atoms combine to form the substances that comprise matter. (II)

Introductory Physics Courses

PHY 1191 Physics 1 4 QH

Focuses on units and scientific notation, force, Newton's first law, static equilibrium, Newton's second law, momentum, work, kinetic energy, potential energy. *Prereq.* MTH 1191, which may be taken concurrently; BET majors only.

PHY 1192 Physics 2 4 QH

Focuses on power, rotational motion, Pascal's law, hydrostatic pressure, molecular mass, ideal gas law, first and second laws of thermodynamics, simple harmonic motion, wave motion, sound, and light. *Prereq.* PHY 1191; MTH 1192, which may be taken concurrently; BET majors only.

PHY 1193 Physics 3 4 QH

Focuses on electrostatics, circuit elements, direct current circuits, magnetism, electromagnetic induction, electromagnetic waves, atomic and nuclear physics. *Prereq.* PHY 1192; BET majors only.

PHY 1201 Physics for the Life Sciences 1 4 QH

Focuses on vector addition of force, principles of statics; Newton's second law, kinetic and potential energy; pressure static properties of fluids, fluid flow. To take the lab for this course, register for PHY 1501 concurrently. (II)

PHY 1202 Physics for the Life Sciences 2 4 QH

Focuses on wave motion, sound, light, optics, static electricity, DC circuits, magnetism. To take the lab for this course, register for PHY 1502 concurrently. (II) *Prereq.* PHY 1201.

PHY 1203 Physics for the Life Sciences 3 4 QH

Focuses on temperature, gas laws, properties of liquids (surface tension and osmotic pressure), properties of solids, thermal physics, Coulomb's law, and atomic and nuclear physics. *Prereq.* PHY 1202.

PHY 1221 Physics for Engineering Students 1 4 QH

The first quarter of a four quarter sequence intended primarily for engineering students, covers mechanics, kinematics, dynamics, Newton's laws, work, energy, linear momentum, collisions. *Prereq.* MTH 1123 or equiv., which may be taken concurrently.

PHY 1222 Physics for Engineering Students 2 4 QH

Continues PHY 1221. Focuses on rotational dynamics, angular momentum, statics, harmonic motion, wave motion, sound, and optics. *Prereq.* PHY 1221; MTH 1124 or equiv., which may be taken concurrently.

PHY 1223 Physics for Engineering Students 3 4 QH

Continues PHY 1222. Focuses on electricity, electrostatics, Gauss's law, electric fields, potential, capacitance, resistance, current Ohm's law, circuits, the magnetic field. *Prereq.* PHY 1222; MTH 1125 or equiv., which may be taken concurrently.

PHY 1224 Physics for Engineering Students 4 4 QH

Continues PHY 1223. Covers induction, inductance, and energy in the magnetic field; electromagnetic waves; exponential processes; and elementary thermodynamics. *Prereq.* PHY 1223; and MTH 1126 or equiv., which may be taken concurrently.

PHY 1231 Physics for Science Majors 1 4 QH

Focuses on mechanics, kinematics, Newton's laws, circular motion, work energy, and linear momentum. To take the lab for this course, register for PHY 1531 concurrently. (II) *Prereq.* MTH 1143 or equiv., which may be taken concurrently.

PHY 1232 Physics for Science Majors 2 4 QH

Focuses on rotational motion, angular momentum, harmonic motion, wave motion, sound, heat and thermodynamics, kinetic theory. To take the lab for this course, register for PHY 1532 concurrently. (II) *Prereq.* PHY 1231; and MTH 1144 or equiv., which may be taken concurrently.

PHY 1233 Physics for Science Majors 3 4 QH

Focuses on electricity and magnetism; circuits; electromagnetic waves; topics in modern physics. To take the lab for this course, register for PHY 1533 concurrently. *Prereq.* PHY 1231; and MTH 1145 or equiv., which may be taken concurrently.

PHY 1251 Physics Review for Engineering Students 6 QH

Offers an intensive review for students who have had previous college physics courses not equivalent to the engineering sequence of PHY 1221 through PHY 1224. Covers fundamentals of mechanics, electricity, and magnetism, with emphasis on the use of vectors and elementary calculus. Equivalent to PHY 1223 and PHY 1224. *Prereq.* One year of college physics and knowledge of elementary calculus.

Introductory Physics Laboratories

PHY 1194 Physics Laboratory 1 2 QH

Covers experiments from various physics topics covered in PHY 1191 and, concurrently, in PHY 1192. Lab fee. *Prereq.* PHY 1191; PHY 1192 concurrently; BET majors only.

PHY 1195 Physics Laboratory 2 2 QH

Covers experiments from various physics topics covered in PHY 1192 and, concurrently, PHY 1193. Lab fee. *Prereq.* PHY 1194, PHY 1192; PHY 1193 concurrently; BET majors only.

PHY 1501 Physics Laboratory for the Life Sciences 1 1 QH

Accompanies PHY 1201. *Prereq.* PHY 1201 concurrently.

PHY 1502 Physics Laboratory for the Life Sciences 2 1 QH

Accompanies PHY 1202. *Prereq.* PHY 1501; PHY 1202 or PHY 1203 concurrently.

PHY 1521 Physics Laboratory for Engineering Students 1 1 QH

The first of a two-quarter lab sequence in which the student performs experiments from various fields of physics. *Prereq.* PHY 1223.

PHY 1522 Physics Laboratory for Engineering Students 2 1 QH

Continues PHY 1521. *Prereq.* PHY 1521 and PHY 1224.

PHY 1531 Physics Laboratory for Science Majors 1 1 QH

Focuses on lab experiments related to topics covered in PHY 1231. *Prereq.* PHY 1231 concurrently.

PHY 1532 Physics Laboratory for Science Majors 2 1 QH

Focuses on lab experiments related to topics covered in PHY 1232. *Prereq.* PHY 1531; PHY 1232 concurrently.

PHY 1533 Physics Laboratory for Science Majors 3 1 QH

Focuses on lab experiments related to topics covered in PHY 1233. *Prereq.* PHY 1531; PHY 1233 concurrently.

Advanced Physics and Astronomy Courses

PHY 1301 Intermediate Mechanics 4 QH

Focuses on classical mechanics in two and three dimensions; a review of Newton's laws; special emphasis on conservation theorems for energy, momentum, and angular momentum; harmonic and wave motion. *Prereq.* PHY 1232 and PHY 1233; and MTH 1243 concurrently.

PHY 1302 Electric and Magnetic Fields 4 QH

Focuses on the basic concepts of electric and magnetic fields, including electric and magnetic fields in free space and materials; Maxwell's equations in integral form. *Prereq.* PHY 1301; and MTH 1244 concurrently.

PHY 1303 Modern Physics 4 QH

Reviews experiments demonstrating the atomic nature of matter, the properties of the electron, the nuclear atom, the wave-particle duality, spin, and the properties of elementary particles. Discusses, mostly on a phenomenological level, such subjects as atomic and nuclear structure, properties of the solid state, and elementary particles. *Prereq.* PHY 1233, PHY 1224, or equiv.

PHY 1304 Mathematical Physics 4 QH

Reviews linear algebra and vector calculus, special functions and partial differential equations of physics, potential theory, functions of a complex variable. *Prereq.* MTH 1244 and PHY 1233; and MTH 1246 concurrently.

PHY 1305 Thermodynamics and Kinetic Theory 4 QH

Focuses on first and second laws of thermodynamics, entropy and equilibrium, thermodynamic potentials, elementary kinetic theory, statistical mechanics and the statistical interpretation of entropy. *Prereq.* PHY 1224 or PHY 1233; and MTH 1244.

PHY 1401 Classical Mechanics 4 QH

Covers advanced topics in classical mechanics, including vector kinematics, harmonic oscillator and resonance, generalized coordinates, Lagrange's equations, central forces and the Kepler problem, rigid body motion. *Prereq.* PHY 1301 and MTH 1245.

PHY 1402 Electricity and Magnetism 1 4 QH

Covers Maxwell's equations and their experimental basis, electrostatics and magnetostatics, the electromagnetic field in empty space, electromagnetic waves. *Prereq.* PHY 1302; and PHY 1304 or equiv.

PHY 1403 Electricity and Magnetism 2 4 QH

Continues PHY 1402. Focuses on energy and momentum in the electromagnetic field, electrodynamics, the interaction of matter and the field, radiation. *Prereq.* PHY 1402 or equiv.

PHY 1404 Wave Motion and Optics 4 QH

Focuses on harmonic and coupled oscillators, wave equation; geometrical and physical optics; interference, diffraction, optics of solids, amplification of light; and lasers. *Prereq.* PHY 1302.

PHY 1411 Introduction to Astrophysics and Cosmology 4 QH

Introduces the student to current ideas in astrophysics and cosmology, with emphasis on recent advances in this field. Focuses on tools of the astronomer (gamma-, X-, UV-, optical-, infrared-, radio-telescopes, spectroscopes, spacecrafts, and so on); solar system; stellar properties (site luminosity); stellar spectra; Hertzsprung-Russell diagram; stellar energy sources (gravitational, nuclear); evolution of stars (birth, main sequence, red giants, white dwarfs, planetary nebulae, supernovae, neutron stars and pulsars, black holes and gravitational collapse); methods of interstellar and intergalactic distance measurement; our Milky Way galaxy; extragalactic objects (galaxies, clusters of galaxies, radio galaxies, quasars); cosmology (Olber's paradox; recession of galaxies, big bang theory, cosmic background radiation, formation of galaxies, the future of the universe). *Prereq.* Three quarters of elementary physics.

PHY 1413 Introduction to Nuclear Physics 4 QH

Focuses on nuclear structure, nuclear masses, radioactivity, nuclear radiation, interaction of radiation and matter, detectors, fission, nuclear forces, elementary particles. *Prereq.* PHY 1303.

PHY 1414 Introduction to Solid State Physics 4 QH

Offers a semiclassical treatment of the thermal, magnetic, and electrical properties of crystalline solids. Examines X-ray diffraction and the reciprocal lattice, elasticity and lattice vibrations, specific heat, properties of insulators, magnetism in insulators and metals, and introduction to the band theory of metals. *Prereq.* CHM 1383 or PHY 1303; and PHY 1305 or equiv.

PHY 1415 Quantum Mechanics 1 4 QH

Focuses on observation of macroscopic and microscopic bodies, the uncertainty principle, wave-particle duality, probability amplitudes, Schrodinger wave theory, and one-dimensional problems. *Prereq.* CHM 1383 or PHY 1303; and PHY 1304 or equiv.

PHY 1416 Quantum Mechanics 2 4 QH

Continues PHY 1415. Covers discrete and continuous states, Schrodinger equation in three dimensions, angular momentum, general theory of quantum mechanics, applications. *Prereq.* PHY 1415.

PHY 1551 Electronics for Scientists 1 4 QH

With PHY 1552, forms a two-quarter sequence covering electronic techniques for experimental research in many different fields of science. Focuses on principles of semiconductor devices; analog techniques (amplification, feedback, integration); digital techniques (counting, multiplexing, logic); design of electronic subsystems (analog-to-digital converters, phase-sensitive detectors, data-logging systems); understanding specifications of commercial electronic equipment. In lab examples, makes use of up-to-date integrated and discrete devices such as are currently used in the electronic industry.

PHY 1552 Electronics for Scientists 2 4 QH

Continues PHY 1551. *Prereq.* PHY 1551.

PHY 1555 Wave Laboratory 4 QH

Offers a general treatment of the problems of mechanical and electromagnetic radiation as wave phenomena. Focuses on the differential wave equation and its application to selected topics; interference and diffraction theory from the standpoint of the Huygens-Fresnel and Kirchhoff formulations; selected experiments in acoustics, optics, and microwaves to illustrate these problems. *Prereq.* PHY 1224 or PHY 1302.

PHY 1557 Advanced Physics Laboratory 4 QH

Presents special projects in modern experimental physics, including electronic instrumentation used in measuring physical quantities and use of microprocessors. *Prereq.* PHY 1551 and PHY 1552.

PHY 1561 Project Laboratory 4 QH

Allows students to select and carry out individual projects involving instrumentation and computation. Involves the development of some aspect of instrumentation and/or computation in an ongoing research project and the preparation of a final report. The student will be supervised by the project leader and the course instructor. (Although the course carries 4 QH credit, it is taken in successive winter and spring quarters.) *Prereq.* *Permission of instructor.*

PHY 1711 Introduction to Astronomy 1 (Honors) 4 QH

Honors equivalent of PHY 1111.

PHY 1721 Physics 1 (Engineering) 4 QH

Honors equivalent of PHY 1221

PHY 1722 Physics 2 (Engineering) 4 QH

Honors equivalent of PHY 1222

PHY 1723 Physics 3 (Engineering) 4 QH

Honors equivalent of PHY 1223.

PHY 1724 Physics 4 (Engineering) 4 QH

Honors equivalent of PHY 1224.

Political Science

Some courses in the College of Arts and Sciences are duplicated in different departments or colleges or within a department. You may not receive credit for two such courses. If you have a question about whether one course overlaps another, please consult the departments involved and the Office of the Dean before taking the course.

The numbers inside parentheses within course descriptions refer to core curriculum categories listed on page 3.

POL 1110 Introduction to Politics

4 QH

Offers an overview of basic concepts such as power, authority and sovereignty, methods of political analysis, and contemporary political ideologies. Discusses such dynamics as political culture, public opinion and participation, and political systems. (II)

POL 1111 Introduction to American Government

4 QH

Analyzes the American system of government and politics. Includes the philosophical origins and design of the Constitution, public opinion, political behavior and participation, parties and interest groups, and formal governmental institutions. May cover cases in domestic and foreign policymaking. (II)

POL 1112 Introduction to International Relations

4 QH

Applies basic theories of international relations to examining the foreign policies of the key actors in the international system. Covers topics of international aid, trade, and monetary affairs; issues relating to the arms race, nuclear proliferation, arms control, and disarmament; international law and organizations, human rights, and the impact of technology on the functioning of the international system. (II)

POL 1113 Introduction to Foreign Governments and Societies

4 QH

Offers a comparative study of parliamentary democracy in Western Europe; Communist totalitarianism in the Soviet Union, China, and Eastern Europe; and variations of these governmental systems in the third world countries of Asia, Africa, and the Middle East. Formerly "Introduction to Comparative Government."

POL 1260 Public Policy Analysis

4 QH

Uses both theoretical literature and case studies to analyze the structure of and dynamics inherent in the American policymaking process. Introduces such concepts as problem definition, agenda-development, policy formation, implementation, and program evaluation. Examines basic policy analysis methods. (VI)

POL 1261 Public Administration

4 QH

Focuses on the theory and practice of public administration, emphasizing the generalities of institutions, processes, and behavior of bureaucratic organizations.

POL 1262 Organization Theory

4 QH

Provides a broad overview of organization theories, their history, and development. Gives specific attention to developing a paradigm for public organizations that focuses on the relationships of economic, democratic, bureaucratic, technological, and humanistic imperatives. Requires the student to prepare a research paper and consider the implications of this paradigm for future organizations.

POL 1266 Public Personnel Administration

4 QH

Presents an overall introduction to the field of public personnel administration. Examines selected topics such as recruitment, selection, classification, case development, equal opportunity, public employee unionism, and collective bargaining. *Prereq.* POL 1261.

POL 1267 Public Budgeting

4 QH

Focuses on the function of budgeting in a variety of governmental contexts, specifically, the appropriations process, the budget as a management tool, and the public policy impacts of the budget. Emphasizes budgeting techniques within this context. *Prereq.* POL 1261.

POL 1301 Research Methods 1

4 QH

Offers an introduction to the principal quantitative methods used in political analysis, public administration, political behavior, international relations, and policy sciences. Emphasizes basic statistical techniques, survey methods, and SPSS programming. *No freshmen or sophomores without permission.*

POL 1302 Research Methods 2

4 QH

Focuses on methods of quantitative analysis. Covers the following primary statistical topics: significance testing, bivariate regression and correlation, and multiple regression and correlation. In addition, teaches elementary computer skills and the use of the programming language Statistical Package for the Social Sciences (SPSS) to calculate advanced statistics. Emphasizes the practical application and understanding of statistical techniques by providing numerous examples in the areas of political behavior, public opinion, and public policy analysis. *Prereq.* POL 1301. *No freshmen or sophomores without permission.*

- POL 1303 Political Behavior** 4 QH
Examines selected topics in contemporary political science from a political behavior perspective. Focuses on political attitude formation and change, ideology, socialization, public opinion and voting behavior, political campaigning, political violence, and empirical democratic theory.
- POL 1304 Practical Politics** 4 QH
Accentuates and systematically treats some of the problems of organizing for effective citizen action, partisan and nonpartisan, at the grass-roots level. Explores roles in political campaigning.
- POL 1306 Politics in Western Europe** 4 QH
Offers a comparative analysis of political culture, federal and unitary forms of government, and executive-legislative relations on the national level in England, France, and West Germany. (III)
- POL 1308 The Politics of Poverty** 4 QH
Explores what is referred to as the poverty system: how and why there is poverty, how it affects people's lives, and how it can be eliminated. As a discussion-centered course, relies on simulations, small-group work, and experience-based learning; examines the relations between poverty, racism, and the economic, political, and administrative systems. Evaluates a number of alternatives and provides an opportunity for clarifying individual assumptions and feelings about poverty.
- POL 1309 International Relations of Rich and Poor Countries** 4 QH
Focuses on international political and economic relations. Examines how nations like the United States, Germany, and Japan use their wealth and military power in dealing with poorer nations in Asia, Africa, Latin America, and the Middle East. Explores the kinds of leverage such poor nations have in return. Includes such topics as colonialism, foreign military intervention, and international trade. *Prereq.* A course in international politics is recommended.
- POL 1310 American Ideology** 4 QH
Analyzes the main American ideologies, including liberalism, neoliberalism, conservatism, neoconservatism, and nationalism. Examines the historic roots of each ideology and its impact on American politics. Explores the ongoing interaction of political ideology and the political process in contemporary American society. (V) *No freshmen or sophomores without permission.*
- POL 1312 Politics and the Mass Media** 4 QH
Analyzes several facets of the mass media: the role of newspapers, radio, and television in public opinion formation; their use and effectiveness in political campaigns; their objectivity and/or bias in reporting the news; their impact on political parties and the distribution of power between Congress and the President.

- POL 1313 International Organization** 4 QH
Focuses on development of international organizations with special emphasis on the United Nations system. (Public Administration elective.)
- POL 1314 Interest Groups and Public Policy** 4 QH
Surveys the roles of organized interests in American public policymaking. Examines why groups are formed, how they work, why they succeed or fail, and what cumulative impacts groups have on policy. Spans a variety of groups, from traditional economic interests to social movements, public interest organizations, and professional lobbyists.
- POL 1316 Contemporary Revolutionary Politics** 4 QH
Examines political development in selected revolutionary societies, including Cuba. (VI)
- POL 1317 Law and Society** 4 QH
Examines the theory and practice of the American legal process and its impact on values. Analyzes the impact the military-industrial-technological complex has on these values. *Open to upperclass students only.*
- POL 1318 State and Local Government** 4 QH
Introduces students to the political and administrative context of state and local government and surveys the structure, function, and politics of states and localities within the context of the United States federal system. (Public Administration elective.) *Prereq.* POL 1111.
- POL 1320 Parties and Elections** 4 QH
Analyzes political parties and the American system of elections. Focuses on structural and constitutional biases, the organizational aspects of the parties, mass voting behavior, the impact of elections on public policymaking, and national and state historical trends.
- POL 1321 Eurocommunism** 4 QH
Examines the domestic and foreign policies of the Spanish, French, and Italian Communist parties, with special attention to their relations with the international communist movement.
- POL 1322 World Politics** 4 QH
Emphasizes various principles, techniques, and patterns that governments have followed to implement their goals or objectives. Uses a case study approach, with an emphasis on the problems associated with the Middle East analyzed from the United States-Soviet and Arab-Israeli viewpoints.
- POL 1324 Urban Politics** 4 QH
Analyzes the political, administrative, economic, and social dynamics of urban areas from a historical perspective. (Public Administration elective.)
- POL 1327 Sex Roles in American Politics** 4 QH
Explores the relation between what is and what ought to be—and why—in the roles of women in

American politics. Examines the traditional roles of women in politics, the suffrage movement, the woman as citizen and voter, the role of sex in achieving power and in political efficacy, and the place of women in "new politics." Also covers political action to promote women's issues and modern feminism. (VI)

POL 1329 American Social Welfare Policy 4 QH

Introduces social welfare policy, with emphasis on programs and services in the contemporary United States. Discusses theoretical frameworks for analyzing social welfare policy; then focuses attention on the substantive areas of welfare, mental health, and social security. Explores various issues and processes related to the design, administration, and implementation of social welfare policy in the context of the American socio-political system. Focuses on social welfare policymaking under the Reagan administration.

POL 1331 Science, Technology, and Public Policy 4 QH

Considers the effects of science and technology on politics and policymaking in America and how politics influences science and technology. Focuses on the differences between scientific and democratic values and definitions of rationality, the nature of public problems, and why some problems are easier to "solve" than others. Particularly looks at such issues as nuclear power, recombinant DNA, abortion, and medical research; addresses the question of who should decide such complex matters. (VI)

POL 1332 Government and Politics of Japan 4 QH

Focuses on the development of Japan's political system since World War II. Examines Japan's political institutions and practice of democracy in the context of its political culture; the interrelationship between business and government; Japan's foreign policy; and business practices and organization. Raises issues concerning Japan's extraordinary economic success and the limitations of Japan as a model for other countries. (IV) *Not open to freshmen.*

POL 1335 The American Presidency 4 QH

Examines the presidential electoral process and the constitutional and extraconstitutional powers of the American President. Studies presidential leadership styles and analyzes the relationship between the executive branch and Congress, the Court, the bureaucracy, and the media.

POL 1336 American Constitutional Law 4 QH

Employing excerpts of United States Supreme Court decisions and other reading materials, attempts to analyze some of the theoretical, structural, and substantive issues inherent in and relevant to the American constitutional system. *Prereq.* POL 1111 and junior or senior standing.

POL 1337 United States Foreign Policy 4 QH

Examines formulation and conduct of foreign policy and the United States since 1945.

POL 1338 Religion and Politics 4 QH

Explores the role of religion in domestic and international politics. Examines religion as a source of political tension and strife. Draws examples from the United States and the developing world. Covers Islamic fundamentalism in African and the Near East, Orthodox Jewish parties in Israel, Catholic liberation theology in Latin America, and Protestant fundamentalism and the religious right in America.

POL 1339 Current Political Issues 4 QH

Analyzes the constitutional and political background of selected contemporary public issues. Primarily for nonpolitical science majors.

POL 1340 Change in Eastern Europe 4 QH

Reviews the roots and character of Communist Party rule. Focuses on the new patterns of political, socioeconomic, and cultural development underway in former Soviet Bloc countries, as well as in Yugoslavia and Albania.

POL 1342 Crisis and Conflict in Black Africa 4 QH

Using films, maps, news clips, discussions, and readings, explores contemporary politics in African nations south of the Sahara. Studies South Africa, Nigeria, Kenya, and Ethiopia, among others. Examines apartheid, colonialism, Afro-Marxism, chieftancy, development, and Pan-Africanism. (VI)

POL 1343 Politics and Violence in Northern Ireland 4 QH

Analyzes the causes of violence in Northern Ireland. Considers historical, sociological, and economic roots of the conflict, but places major emphasis on politics. Also discusses the international dimension (the roles of southern Ireland, the United States, and so on), paramilitary organizations, legal political parties and groups, and potential solutions. Draws comparative parallels, including possible lessons for the United States.

POL 1345 Government and Politics in the Middle East 4 QH

Approaches the political, economic, military, and ideological factors within the Arab states and Israel, inter-Arab politics, the Arab-Israeli conflict, and the great power rivalry in the region. (VI)

POL 1347 Soviet Government 4 QH

Studies Soviet political system history since 1917. Focuses on the origins, scope, and consequences of the reforms that have occurred since 1985. Emphasizes economic, political, administrative, and national identity issues.

POL 1348 Soviet Foreign Policy 4 QH

Studies Soviet foreign policy, particularly since the mid-1980s. Gives special attention to the causes, content, and consequences of changes in Soviet international behavior. Focuses on Soviet relations toward east and west Europe, the United States, China, Japan, and selected regions in the "developing" world, most notably the Middle East and central Asia.

POL 1350 American Legislative Process 4 QH

Explores the structures, dynamics, and styles inherent in public policymaking within the U.S. Congress. Focuses on elections; representation of constituents' interests; the roles played by members, the president, interest groups, and other actors; and how all of this is affected by the structure of Congress and the processes embedded in the legislative body.

POL 1351 Techniques and Practices of Public Management 4 QH

Focuses on practical skills and techniques of public management. Employs the case method in examining typical management problems at different levels of government. Also covers time and resource management for public sector managerial personnel.

POL 1353 Law and Personal Morality 4 QH

Examines the use of political power to enforce standards of personal morality and behavior in contemporary American society. Considers such subjects as pornography, sexual privacy and expression, Sunday closing laws, abortion, and prostitution.

POL 1362 Civil Liberties 4 QH

Employing United States Supreme Court decisions and other reading material, examines the substantive and procedural guarantees of the Bill of Rights and the Fourteenth Amendment and their relation to a liberal democratic society.

POL 1364 Business and Government Relations 4 QH

Surveys the relation between economic developments and political processes in the United States. Considers government planning of the economy, monopoly and government regulation, government programs to promote social welfare, and the impact of Federalism on the political-economic system, among other topics.

POL 1368 Government and Politics of Latin America 4 QH

Examines the governmental systems, political parties, socioeconomic problems, and foreign policies of Latin American states. Focuses on political change. (IV)

POL 1369 Political Violence 4 QH

Analyzes political violence in its various contemporary forms (for example, revolution, genocide, political terrorism, military overthrows). Assesses the causes and consequences of political violence (from both practical and moral points of view) and considers strategies for preventing and resolving political violence.

POL 1371 Government and Politics of China 4 QH

Focuses on China's political system during Communist party rule. Addresses fundamental issues that the government has been unable to

resolve successfully including leadership recruitment and succession; economic growth; class and class struggle; political culture and the educational system; the nature of socialist democracy and socialist legality; and the appropriate form of socialism for a country wishing to modernize rapidly. Examines the interaction among ideology, development, and culture on these issues. (IV) *Not open to freshmen.*

POL 1373 Pre-Modern Political Thought 4 QH

Presents an analytical and historical examination of the great political thinkers and the main trends of political thought from classical Greece to the Renaissance. (V) *Prereq. Junior standing or permission of instructor.*

POL 1374 Modern Political Thought 4 QH

Presents an analytical and historical examination of the great political thinkers and the main trends in political thought from the Renaissance to the twentieth century. (V) *No freshmen without instructor's permission.*

POL 1379 Marx and Marxism 4 QH

Studies the social and political thought of Karl Marx. Examines the development of Marxian theory after Marx's death. Discusses class struggle, social revolution, and communism. (V)

POL 1382 Intergovernmental Relations 4 QH

Analyzes the relationships among national, state, and local levels of government in the United States and the changing patterns of those relationships.

POL 1384 Arab-Israeli Conflict 4 QH

The Arab-Israeli confrontation has its own dynamics, and its nature has changed through the decades. This course analyzes its effects on the internal politics of the Arab states and Israel, Pan-Arab politics, and the role of the great powers in the region. (VI)

POL 1386 International Law 4 QH

Focuses on territory and jurisdiction of states, treaties, recognition, peaceful settlement of disputes, resort to force. *Prereq. POL 1112.*

POL 1388 Political Polling and Survey Research 4 QH

Examines the entire survey research process, which is the most common approach to program evaluation survey design, sampling, questionnaire design, survey administration, data processing, and data analysis. Also involves some statistical analysis. *Prereq. POL 1301.*

POL 1389 American National Security Policy 4 QH

Traces the evolution of American national security policy in the post-World War II period. Considers American nuclear military policy and conventional non-nuclear military policy. Explores arms control policy.

POL 1410 Seminar in American Government 4 QH
Offers an in-depth study of selected topics in American government. *Prereq.* Senior political science major and permission of instructor.

POL 1411 Seminar in International Relations 4 QH
Offers an in-depth study of selected topics in international relations. *Prereq.* Senior political science major and permission of instructor.

POL 1413 Senior Seminar in Political Science 4 QH
Offers an in-depth study of selected topics in political science. *Prereq.* Senior political science major.

POL 1415 Seminar in Public Law and Social Issues 4 QH
Uses legal writings and recent court cases to examine some of the continuing and perplexing social problems. Discusses issues such as abortion, euthanasia, family planning, criticism of public officials, political activism, the right of privacy, obscenity, racial and economic discrimination. *Prereq.* Junior or senior standing and permission of instructor.

POL 1710 Introduction to Politics (Honors) 4 QH
Honors equivalent of POL 1110.

POL 1711 Introduction to American Government (Honors) 4 QH
Honors equivalent of POL 1111.

POL 1712 Introduction to International Relations (Honors) 4 QH
Honors equivalent of POL 1112.

POL 1800, POL 1801, POL 1802 4 QH each
Directed Study
Offers independent work on chosen topics under the direction of members of the department. *Prereq.* Junior or senior standing and permission of instructor.

POL 1803 Internship in Politics 4 QH
With department approval, students engage in a political or governmental internship under the supervision of a faculty member. Junior or senior status normally required.

POL 1804 Practicum in Lobbying 4 QH
Offers fieldwork opportunity for students to become involved in supervised lobbying activity on the national or state levels of politics. (May be taken only once for academic credit.) *Prereq.* Middler, junior, or senior standing.

POL 1806 Political Science Honors Program Minicourse 1 QH
Deals with specialized topics in political theory.

Psychology

Some courses in the College of Arts and Sciences are duplicated in different departments or colleges or within a department. You may not receive credit for two such courses. If you have a question about whether one course overlaps another, please consult the departments involved and the Office of the Dean before taking the course.

Numbers inside parentheses within course descriptions refer to core curriculum categories listed on page 3.

For additional information concerning psychology department programs and course scheduling, inquire at the main office of the Department of Psychology, 125 Nightingale Hall, 617-437-3076.

PSY 1110 Perspectives in Psychology 1 4 QH
Surveys the fundamental principles and issues of the major areas of contemporary scientific psychology. Approaches the study of psychology as a method of inquiry as well as a body of knowledge. Emphasizes biological bases of behavior, principles of learning and motivation, psychological testing, personality dynamics, psychopathology, and therapeutic approaches. Students who earn credit for PSY 1111 will not earn credit for PSY 1110. (II)

PSY 1111 Foundations of Psychology 1 4 QH
Surveys the fundamental principles and issues of the major areas of contemporary scientific psychology. Approaches the study of psychology as a method of inquiry as well as a body of knowledge. Emphasizes biological bases of behavior, principles of learning and motivation, psychological testing, personality dynamics, psychopathology, and therapeutic approaches. Students who earn

credit for PSY 1110 will not earn credit for PSY 1111.

PSY 1112 Foundations of Psychology 2 4 QH
Continues PSY 1111, emphasizing the areas of lifespan development, sensory and perceptual processes, states of consciousness, cognition, language, memory, emotion, and social influences on behavior. (Overlaps PSY 1113.) *Prereq.* PSY 1110 or PSY 1111.

PSY 1113 Perspectives in Psychology 2 4 QH
Continues PSY 1110, emphasizing the areas of lifespan development, sensory and perceptual processes, states of consciousness, cognition, language, memory, emotion, and social influences on behavior. (Overlaps PSY 1112.) (II) *Prereq.* PSY 1110 or PSY 1111.

PSY 1210 Research Methods in Psychology 4 QH
Introduces research methods in psychology such as field research, content analysis, case research,

survey methods, simulations, and laboratory experiments. Examines issues of research fairness and evaluating research methods. Explores basic statistical notions including sampling, variability, and correlation. *Prereq.* PSY 1112 or PSY 1113.

PSY 1211 Statistics in Behavioral Science 1 4 QH

Introduces descriptive statistics (scales of measurement, frequency distribution and graphs, measures of central tendency, dispersion and correlation, standard scores, and the unit normal curve) and probability theory (permutations, combinations, and the binomial theorem). *Prereq.* MTH 1101 or MTH 1107.

PSY 1212 Statistics in Behavioral Science 2 4 QH

Offers a general presentation of hypothesis testing, including parametric and nonparametric tests, with emphasis on formulating hypotheses and choosing appropriate scales of measurement, tests, and confidence levels. *Prereq.* PSY 1211.

PSY 1215 Sexual Behavior 4 QH

Focuses on the sexual activities of the human male and female from infancy to adulthood. Considers the importance of sexual factors in the life history of the individual, statistical surveys of sexual behavior, and direct observational measures of sexual responding. Explores the nature of love, responses to pornography, prostitution, bisexuality, male and female homosexuality, rape, child abuse, and sexual therapy.

PSY 1218 Psychology of Women 4 QH

Introduces the student with little or no background in psychology to the current theories and research on the psychology of women. Critically examines psychological, biological, and social influences on gender differences, gender roles, and gender stereotypes in the light of scientific evidence and individual experience. Assesses their consequences for society. Uses the unique perspective generated in the field of the psychology of women to evaluate traditional research methods in psychology as well as the major psychological theories formulated to explain women and the differences between women and men. Emphasizes critical-thinking skills.

PSY 1220 Biological Basis of Mental Illness 4 QH

Examines current hypotheses of brain dysfunction involved in mental illness. Explores the field of biological psychiatry including events in the brain that can be linked to mental disorder. Studies current neurochemical and genetic theories of diseases such as schizophrenia and depression. Emphasizes recent research and critically assesses treating mental disorders biologically, such as with drug therapy.

PSY 1231 Learning and Motivation 1 4 QH

Offers an introduction to the basic learning and motivational principles that permit humans and animals to adapt effectively to a changing

environment. Emphasizes research and theories of operant and Pavlovian conditioning, with discussions of discriminations and generalization, avoidance and punishment, acquired motivational states (for example, addiction), concept formation, biological constraints on learning and behavior, animal cognition, and other related topics. Relates learning and motivational principles to the understanding and treatment of behavioral, affective, cognitive, and motivational disorders. *Prereq.* PSY 1112 or PSY 1113.

PSY 1241 Human Behavioral Development 1 4 QH

Examines the change in behavioral processes from conception up to, but not including, adolescence. Studies biological bases of behavioral development and the development of motor control, sensation, perception, cognition, language, emotion, personality, and socialization. Examines major theories of development and child-rearing practices. *Prereq.* PSY 1112 or PSY 1113.

PSY 1242 Human Behavioral Development 2 4 QH

Continues the examination of behavioral change from adolescence to death. Examines biological, cognitive, moral, personality, and social processes. Assesses different methods of study and theories of adult development. *Prereq.* PSY 1241.

PSY 1243 Infant Development 4 QH

Focuses on the fact that during the first two years of life, the basic physical perceptual, cognitive and emotional capacities emerge and interact in the development of such complex behaviors as visually guided movement, the formation of social attachments, and the emergence of language. Provides an introduction to this critical period of human development; emphasizes how the infant's biological inheritance interacts with the physical and social environment in the generation of these important abilities and behaviors. *Prereq.* PSY 1241 or ED 1102.

PSY 1251 Food, Behavior, and Eating Disorders 4 QH

Investigates what starts and stops eating behavior. Examines taste, nutrition, metabolism, the brain, food experiences, and societal factors that control feeding behavior. Emphasizes the biological/psychological interaction in normal eating and in pathological eating, such as anorexia, bulimia, and extreme obesity.

PSY 1262 Psychology of Language 4 QH

Introduces psycholinguistics (psychology of language). Topics include language's nature and structure, processes involved in producing and comprehending language, the biological bases of language, and aspects of acquiring language. Examines current language processing theories and research. *Prereq.* PSY 1112 or PSY 1113.

PSY 1263 Nonverbal Communication 4 QH

Examines the messages we send by posture, facial expression, gesture, gait, and interpersonal distance. Also explores how power, status, and

gender affect nonverbal communication. *Prereq.* PSY 1112 or PSY 1113.

PSY 1271 Social Psychology 4 QH

Provides an introductory survey of social psychology. Focuses on aggression, attribution, attitude formation, change, measurement, conformity, impression formation, group processes (social facilitation, deindividuation, for example). *Prereq.* PSY 1112, PSY 1113, or permission of instructor.

PSY 1272 Personality 1 4 QH

Offers a systematic study of the normal personality and its development. Focuses on behavioral, dynamic, and constitutional determinants, assessment of personality, research; surveys the major theories of personality. *Prereq.* PSY 1112 or PSY 1113.

PSY 1273 Personality 2 4 QH

Continues PSY 1272. *Prereq.* PSY 1272.

PSY 1274 Psychology and the Law 4 QH

Traces the effects of psychological factors through the course of a trial, including such issues as accuracy of eyewitness identification, plea bargaining, jury selection, persuasion tactics in the courtroom, presumption of innocence, jury size, jury decision rules, and sentencing and punishment.

PSY 1351 Psychobiology 4 QH

Focuses on the relation between brain function and human behavior. Examines how nerve cells function individually and work together both in small networks and in the nervous system; the structure of the nervous system; how our sense organs provide the nervous system with information about the outside world; how the brain controls movement; and how psychological concepts from motivation to language and memory are represented in the brain. *Prereq.* PSY 1112, PSY 1113, or permission of instructor.

PSY 1353 Comparative Psychology and Ethology 4 QH

Surveys animal behavior in a wide range of species (reptiles, birds, fish, and mammals, including humans) to find similarities and differences in the behavioral processes and physiological mechanisms by which individual organisms and species adapt to their environments. In the first section, focuses on adaptive specializations exhibited by animals in learning about their environments during early development and as adults. In the second section, examines problems of social organizations at the individual level: how animals communicate with each other and transmit "cultural" skills; mechanisms underlying cohesion and dispersal (for example, reproduction and aggression); and the adaptive advantages of being social or asocial. In the final section, provides students with an unusual opportunity to apply concepts and experimental methods they have learned by actually doing a short field study of animal behavior at the Boston Zoological Park. *Prereq.* PSY 1112, PSY 1113, or permission of instructor.

PSY 1361 Introduction to Phonetics 4 QH

Offers an introduction to the nature of the speech signal from articulatory, perceptual, and acoustic points of view. Focuses on sound measurement, sound classes, and a survey and comparison of speech sounds used in languages in the world. Studies stress, tone, and intonation. Examines phonetic classification and transcription of speech as practical tools for students of languages, linguistics, and speech and hearing science. *Prereq.* PSY 1262 or permission of instructor.

PSY 1362 Child Language 4 QH

Examines how language develops in children. *Prereq.* PSY 1262, linguistics, or permission of instructor.

PSY 1365 Language and the Brain 4 QH

Focuses on linguistic behavior from a neuro-psychological viewpoint. Examines models of how the nervous system, and the brain in particular, controls the production, perception, and internal manipulation of language. Considers localization of cerebral functions and hemispheric lateralization; experimental and clinical evidence for functional models; aphasia and other language pathologies; schizophrenic language; evidence from "slips of the tongue"; and the bilingual brain. Compares speech, sign language, and writing systems. Also discusses interpretation and translation. *Prereq.* PSY 1262 or permission of instructor.

PSY 1373 Abnormal Psychology 1 4 QH

Focuses on the abnormal personality, including a historical survey and a discussion of such issues as anxiety, defense mechanisms, and the criteria of psychopathology. Also examines the symptomatology, etiology, and dynamics of neuroses (hysteria, phobia, obsession, and compulsion) and of psychosomatic disorders. Discusses case histories. *Prereq.* PSY 1112 or PSY 1113.

PSY 1374 Abnormal Psychology 2 4 QH

Offers a survey of psychological and somatic therapies. Examines symptomatology, etiology, dynamics, and therapy of psychoses (schizophrenia, paranoia, mania, depression). Also discusses sociopathic and organic disorders. *Prereq.* PSY 1373.

PSY 1381 Sensation 4 QH

Provides an introduction to the study of our senses, with emphasis on hearing, touch, taste, and smell. Focuses on how we measure our sensory abilities and relates findings to the functioning of sensory organs—ears, skin, mouth, and nose—and of the sensory nervous system. *Prereq.* PSY 1112 or PSY 1113; PSY 1351 is highly recommended.

PSY 1382 Perception 4 QH

Offers a study of our awareness of the world around us, exemplified primarily by visual perception. Covers light, visual sensory mechanisms, color vision, illusions, consciousness, and dreams. *Prereq.* PSY 1112 or PSY 1113; PSY 1351 is highly recommended.

PSY 1431 Behavior Therapies 4 QH

Offers a study of successful projects that have provided effective remediation and rehabilitation in institutions for the mentally ill, the mentally retarded, and the developing human (schools). *Prereq.* PSY 1231 or permission of instructor.

PSY 1451 Psychopharmacology 4 QH

Examines interactions between drugs, brain, and behavior. Focuses on such topics as synaptic transmission, behavioral functions of specific neurotransmitter systems, pharmacological treatment of mental and neurological disorders, and drug abuse. *Prereq.* PSY 1351 or equiv. with permission of instructor.

Directed Studies — Honors Courses

PSY 1710 Perspectives in Psychology 1 (Honors) 4 QH

Honors equivalent of PSY 1110. (II)

PSY 1713 Perspectives in Psychology 2 (Honors) 4 QH

Honors equivalent of PSY 1113.

PSY 1770 Honors Directed Study 4 QH

For details contact the undergraduate coordinator in the psychology department, 125 Nightingale Hall.

PSY 1890, PSY 1891, PSY 1892, PSY 1893, PSY 1894 Directed Study 4 QH each

This course offers independent work under the direction of the psychology department, usually in a research project in one of the department labs. Faculty members normally require completion of advanced lab courses in the area of research interest, but this is a matter of individual discussion. Students interested in directed study should consult a departmental adviser. *Prereq.* Permission of instructor.

PSY 1895, PSY 1896, PSY 1897, PSY 1898, PSY 1899 Junior/Senior Honors Program 4 QH each

For details contact the Honors Office, 215 Lake Hall.

Laboratories

PSY 1511 Experimental Design in Psychology 4 QH

Focuses on the experimental method in the design, execution, analysis, and reporting of psychological investigations of humans and animals. Lab fee. *Prereq.* PSY 1112 or PSY 1113 and PSY 1212.

PSY 1530 Experiments in Learning and Motivation 4 QH

Gives students the opportunity to assess the generality, specificity, and robustness of learning and motivational principles through human laboratory studies and field experiments with free-ranging feral animals. Involves designing and conducting experiments and writing reports on operant and Pavlovian conditioning, adjunctive behavior, biofeedback, concept formation, and related topics. Focuses on the theoretical and clinical implications of experimental findings.

This course does not use laboratory animals. *Prereq.* PSY 1231 and PSY 1211.

PSY 1531 Learning and Motivation Laboratory 4 QH

Gives students the opportunity to gain proficiency, through direct experience, in lab analysis of behavior and in evaluating common generalizations about human behavior. Expects students to design and perform experiments in animal and human learning, memory, decision processes, concept formation, and other topics of individual interest. Lab fee. *Prereq.* PSY 1212 and PSY 1231.

PSY 1551 Laboratory in Psychobiology 4 QH

Students conduct three separate research projects, of which the first two will use rats and the third will use humans as subjects. The three projects investigate the effects of intracranial electrical stimulation of reward systems in the rat brain; electroencephalogram (EEG) records of different phases of sleep and lateralization of function between the left and right cerebral hemispheres. Students carry out all the phases of experimentation, including surgery, behavioral tests, frozen sections and staining of brain tissue in preparation for histological examination of electrode placements, and data analyses. This course ends with oral presentations by students of their research findings. *Prereq.* PSY 1351 or permission of instructor.

PSY 1562 Laboratory in Psycholinguistics 4 QH

Provides students the opportunity to acquire first-hand experience in conducting research on problems in the psychology of language. Involves students in all aspects of each experiment, including collecting and analyzing data and preparing reports. Focuses on the particular experiments conducted and the implications of the experimental findings for broader issues in the psychology of language. *Prereq.* PSY 1211 and PSY 1262 or permission of instructor.

PSY 1564 Cognition Laboratory 4 QH

Focuses on experiments related to topics in PSY 1364. *Prereq.* PSY 1212 and PSY 1364 or permission of instructor.

PSY 1571 Laboratory in Social Psychology 4 QH

Provides an introduction to the methods of social-psychological research. Assists students in developing the ability to read published social research with a critical eye, to pose questions in a testable manner, to apply experimental methods to social research, and to express themselves in APA journal style. *Prereq.* PSY 1212 and PSY 1271.

PSY 1572 Personality Laboratory 4 QH

Provides an introduction to the methods and areas of personality research. Discusses problems of measurement, control, and interpretation. Critically examines representative published experiments. Expects students to design, collect data for, assess, and write up several experiments,

including one original research project. *Prereq.* PSY 1212 and PSY 1272.

PSY 1581 Sensation and Perception Laboratory 4 QH

Focuses on experiments involving precise measurements of both physical and psychophysical phenomena, including auditory function, color vision and after-effects, muscular sensation, tactile sensitivity, and adaptation to perceptual distortions. *Prereq.* PSY 1212 and PSY 1381 or PSY 1382.

Seminars

PSY 1614 Seminar on Heredity and Society 4 QH

Focuses on the origins of the intelligence testing movement and the movement's relation to eugenics and to behavior genetics. Studies history, methods, substantive findings, and social implications of psychological measurement and testing. Examines the extensive research literature on intelligence testing and the nature/nurture problem in areas such as psychopathology, criminality, and alcoholism. *Prereq.* Permission of instructor.

PSY 1632 Seminar in Behavior Modification 4 QH

Discusses topics in behavior modification in a seminar format. *Prereq.* PSY 1231, PSY 1531, or permission of instructor.

PSY 1651 Seminar in Psychobiology 4 QH

Offers intensive study, discussion, and practice in lab studies of physiological variables. Covers evolution of the nervous system, sensory and motor mechanisms, motivation and emotion, sleep, attention and perception, learning, and memory. *Prereq.* PSY 1351 or permission of instructor.

PSY 1661 Seminar in Psycholinguistics 4 QH

Focuses on the on-line processing of language. Discusses recent research in light of such questions as, While listening to someone speak, how does the listener process the information carried by the acoustic signal? What is the role of linguistic rules, prediction strategies, and contextual information? And when speaking, what processing stages are involved from the moment the speaker decides to speak to the moment the articulators start functioning? Examines these and other questions, as well as experimental techniques and current trends in psycholinguistics. *Prereq.* PSY 1262 or permission of instructor.

PSY 1662 Seminar in Cognition 4 QH

Varies in subject matter by term. *Prereq.* PSY 1364.

PSY 1671 Seminar in Social Psychology 4 QH

Expects students to examine and present in class their findings on a particular topic in social psychology, for example, attribution, aggression, conformity, attitude-behavior relationship. *Prereq.* PSY 1271 or permission of instructor.

PSY 1672 Seminar in Clinical Psychology and Personality 4 QH

Offers seminar presentations of topics relevant to understanding the normal and disturbed personality. Covers topics such as specialized assessment procedures, cognitive styles in personality, temperament, hypnosis, anxiety, aggression, specialized clinical syndromes, and the development of conscience. *Prereq.* PSY 1373 or permission of instructor.

Anthropology

Some courses in the College of Arts and Sciences are duplicated in different departments or colleges or within a department. You may not receive credit for two such courses. If you have a question about whether one course overlaps another, please consult the departments involved and the Office of the Dean before taking the course.

Numbers inside parentheses within course descriptions refer to core curriculum categories listed on page 3.

SOA 1100 Peoples and Cultures 4 QH

Surveys concepts in anthropology (the study of culture). Analyzes a range of societies in terms of such sociocultural institutions as kinship, gender relations, economics, politics, and religion. Examines important political and economic processes, such as colonialism and development, affecting cultures around the world.

SOA 1101 Cultural Meaning and Everyday Life 4 QH

Using anthropological ideas, studies the underlying patterns of meaning that are below the surface of everyday thought and behavior. Examines daily routines, leisure activities, joking and humor, speech patterns, popular culture, current

folklore and mythology, nonmonetary economic transactions, kinship and friendship, and religion and ritual.

SOA 1104 Cultures of the World 4 QH

Introduces the student to societies around the globe. Intensively examines a number of societies analyzes the factors enabling cultures to develop their unique patterns. Emphasizes developing the ability to compare and contrast societies in a controlled and valid way, as well as looking at societies in a constant attempt to adapt to changing environments. (II)

SOA 1120 Camera on Culture: Visual Anthropology 4 QH

Explores how cultures are portrayed on film. Examines anthropologists' use of film to gather information and represent other peoples. Also examines how filmmakers from postcolonial societies have addressed the respective cultures, the experience of colonialism, and the nature of film-making and film/video consumption in the third world. When possible, a production experience is included. (IV)

SOA 1125 Introduction to Archaeology 4 QH

Traces the history of archaeology, focusing intensively on key sites in the new and old worlds. Uses film and slides of sites and artifacts extensively.

SOA 1146 Peasants: Community, Culture and Rebellion 4 QH

Provides students with an understanding of peasant societies in the third world today. Outlines classic peasant studies, but also focuses on the relationship between peasant communities and class formation, and peasant organizing efforts on issues such as land reform. Examines the gender division of labor, peasant households, peasant ceremonial life. Uses case studies on Latin America, but also includes examples from other areas. (IV)

SOA 1155 Individual and Culture 4 QH

Explores the ways in which individuals are shaped by society and the ways in which they can effect change.

SOA 1160 Sex, Sex Roles, and Family 4 QH

Examines popular and scientific notions about sex, gender relations, family, and kinship. Examines why our images of family, masculinity, and femininity are not universal by analyzing the patterns of sex roles, sexual practices, and kinship in other cultures. Discusses how and why relations between men and women change during times of socioeconomic and political change.

SOA 1185 War and Aggression 4 QH

Using anthropological investigations, critically evaluates the assumption that aggression is part of human nature and linked to sex differences. Discusses cross-cultural variation in violent behavior and warfare in the context of wider political and economic processes. Analyzes the widespread belief in innate masculine aggression as it relates to contemporary societal violence and militarism.

SOA 1220 Culture and Mental Illness 4 QH

Discusses and analyzes the nature and meaning of culture, the role of culture in personality formation, culture and anxiety, anthropological approaches to the "normal" and the "abnormal," and the question "Is mental illness psychological fact or cultural fiction?"

SOA 1255 Sport in Society 4 QH

For course description, see SOC 1255.

SOA 1275 Musical Culture: Notes in the Modern World 4 QH

The ongoing social, political, and cultural dialogues reflect the people who compose, play, and listen to music. This course explores issues of class, ethnicity, gender, sexuality, and age in the cross-cultural context of music as expressed in performances, recordings, videos, literary, and ethnographic materials. The course will also examine the social production and consumption of music. Expects students to conduct a series of field exercises.

SOA 1301 Human Origins 4 QH

Offers an intensive look at the data on fossil remains and contemporary primates, which are essential for an understanding of human physical and behavioral evolution. Efforts are made to bring the student into direct contact with primary materials. (II)

SOA 1303 Sexuality and Culture 4 QH

Examines sexuality in a cross-cultural perspective including issues of sexual identity, the relationship of sexuality to the life cycle, sexual ideologies, and the links between sexuality and the reproduction of cultural norms. Topics include cross-cultural variation in sexual expression, sex and reproduction as commodities, sexuality and violence, sexually transmitted diseases and social policy. Compares sexuality issues in the United States to those of other cultures.

SOA 1310 Global Markets and Local Cultures 4 QH

Discusses selected topics in the socioeconomic transformation of other cultures, including urbanization, industrialization, commodity production, and international labor migration. Focuses on the impact of capitalist development on contemporary third world and postcolonial societies; examines local responses to those changes.

SOA 1320 Anthropology Methods 4 QH

Examines theory and practice of methods of field research and data analysis. Gives students the opportunity to take part in a field project.

SOA 1335 Language and Culture 4 QH

Focuses on the anthropological study of linguistics. Presents basic theories of sociolinguistics and explores language in its social context. Includes animal communication; language learning; language and mind; cognitive and symbolic anthropology; the ethnography of speaking, speech, and boundaries; multilingualism; language and gender; language and ethnicity; language and social class; and pidgins and Creoles. Includes several field assignments.

SOA 1345 People in Cities 4 QH

Studies urban life and urban problems, using international case studies. Addresses rural/urban and international migration, the relationship of urban settlement to employment patterns, the

creation of inner-city or suburban ghettos or squatter settlements, and movements for city services in areas of spontaneous growth. Gives students the chance to design and implement a field project.

SOA 1425 Cultural Survival 4 QH

Examines the problems faced by today's tribal peoples and national minorities. Using cross-cultural case studies, analyzes the relationship of governmental policies and economic development priorities to the survival of self-identified tribal cultures and minority populations throughout the world. Examines human rights, nationalism, and cultural autonomy, resistance, and self-determination.

SOA 1430 Latin American Society and Development 4 QH

Explores the processes of social, economic, and cultural change in Latin America. While concentrating on the present, traces class formation, agrarian structures, ethnic identity, ceremonial organization, gender roles, and political conflict since the colonial era in a range of countries. Emphasizes the relationship of communities and national political and economic systems. May emphasize Central America and Mexico or countries in South America through case studies.

SOA 1431 Native North Americans 4 QH

Explores North American Indian tribes including the Dakota (Sioux), Navajo, Pueblo, Mohawk, and Penobscot, and examines the historical changes that led to their contemporary situation. Focuses on the reservation and its many problems from various viewpoints.

SOA 1470 Religion and Myth 4 QH

Focuses on nature and institutionalization of primitive, ancient, and contemporary religions. Explores religious concepts and movements in relation to social, religious, and political organization.

SOA 1704 Cultures of the World (Honors) 4 QH

Honors equivalent of SOA 1104.

SOA 1800, SOA 1801 Directed Study 4 QH

Offers independent work on a chosen topic under the direction of members of the department. Limited to qualified seniors with approval of the department chair. *Prereq.* Department approval.

SOA 3100 Theory 4 QH

Qualified undergraduates can take this graduate school course, with permission of instructor.

Sociology

SOC 1100 Introduction to Sociology 4 QH

Explores basic concepts and theories concerning the relation between individuals and society. Emphasizes the influence of culture, social structure, and institutions in explaining human activity. Discusses and analyzes social groups, socialization, community, class, power, and social change, among other substantive issues.

SOC 1101 The Sociology of Everyday Life 4 QH

Examines the development, application, and consequences of rules for everyday activities (for example, walking, talking, eating, drinking, sitting, smoking, laughing, crying, and sleeping). Considers the effects of artifacts, culture, space, and territory on these activities, on social life, and on the expression of emotions.

SOC 1102 Social Inequality and Communication 4 QH

Analyzes the ways in which groups and institutions, in both their ritual and everyday activities, communicate the idea of hierarchy and an individual's place in it through face-to-face interaction, formal communication, and the use of space and time. Takes a dramaturgical approach to social organization, with special emphasis on status images in the media and the communication of social place by service organizations and professional groups. Includes some content analysis and observational fieldwork.

SOC 1103 American Society 4 QH

Focuses on American society, culture, and major social institutions: economic, religious, governmental, familial, educational, welfare, and recreational. Examines social classes and stratification, mobility, and individualism. *Prereq.* SOC 1100 or equiv.

SOC 1104 Contemporary Japanese Culture and Society 4 QH

Focuses on contemporary Japanese urban society. Examines major values, family structure, sex roles, social control, the economy and the division of labor, mass media, religion, arts, and social problems. (See SOA 1434.) (IV)

SOC 1105 Society and Culture in the Soviet Union 4 QH

Focuses on contemporary Soviet society. Emphasizes the social, economic, and political reforms of the Gorbachev period and the ways in which the Soviet Union has evolved since 1917. (IV)

SOC 1120 Sociology of Boston 4 QH

Examines Boston from the perspectives of environmental development, neighborhood and intergroup relations, institutional services, and symbolic meanings. Explores current issues in the city through term projects. Requires field trips. *Does not meet elective requirement for sociology / anthropology major.*

SOC 1121 Doing Sociology**4 QH**

Takes a research approach to sociology. Focuses on students' participation in their own learning about sociology as a body of knowledge and as a method of studying social life. Requires students to use the computer during the course. (II)

SOC 1125 Social Problems**4 QH**

Analyzes five major sociological perspectives on social problems (pathology, disorganization, value conflict, deviance, and labeling). Examines the conditions under which certain recurrent events, activities, and persons become redefined as social problems (for example, mine disasters, marijuana smoking, and alcoholism). Studies the typical responses to social problems and their consequences.

SOC 1135 Social Psychology**4 QH**

Offers a sociopsychological approach to individual behavior in social contexts. Introduces basic concepts, such as socialization, identity, self-concept, role conflict, attitudes and attitude measurement, and groups and group processes. Surveys major theoretical orientations and important substantive topics.

SOC 1140 Sociology of Prejudice**4 QH**

Examines factors in the development and maintenance of prejudice and discrimination. Discusses American race relations, anti-Semitism, sex roles, and stereotyping.

SOC 1146 Environment and Society**4 QH**

Examines the political economy of the global environmental crisis. Topics vary from quarter to quarter and include such issues as world resource availability, energy, pollution, ecological degradation in the Third World, environmental policy, and social movements. Involves practical experience in environmental problem solving. (VI)

SOC 1147 Cities and Society**4 QH**

Focuses on the foundations of urban life in historical perspective. Analyzes relation of city life to environment, population, social organization, technology and cultural values. Examines growth trends, urbanization, urban planning, and citizen action. (Formerly Urban Society).

SOC 1150 Introduction to Women's Studies: Image, Myth, and Reality**4 QH**

See INT 1150 for course description.

SOC 1155 Sociology of the Family**4 QH**

Focuses on the family as a social institution in several selected cultures; interrelations of the family and political, economic, and educational institutions; social nature of personality; role taking; individualism, mobility, and industrialism. (V)

SOC 1156 Violence in the Family**4 QH**

Examines physical, emotional, and sexual violence in families, with emphasis on child, sexual, and spouse abuse. Covers definitions, prevalence, causes, prevention, and treatment of specific cases of domestic violence. Focuses on social policy

issues and problems of legal intervention in cultural and family issues.

SOC 1160 Sex-Gender Roles in a Changing Society**4 QH**

Reviews and applies theories about the determinants of sex statuses and roles from historical and cross-cultural perspectives. Focuses on women's status in different institutions of American society.

SOC 1168 The Social Movements of the 1960s**4 QH**

Considers the social and cultural movements of the 1960s and their origins in the Civil Rights movement. Examines the opposition to government policies and social norms that developed into the Civil Rights, student, New Left, antiwar, countercultural, and women's movements in order to understand their grievances, goals, composition, and impact.

SOC 1170 Race and Ethnic Relations**4 QH**

Focuses on racial and religious groups, particularly with reference to the United States. Places special emphasis on historical development, specific problems of adjustment and assimilation, and specific present-day problems and trends.

Prereq. SOC 1100 or equiv.

SOC 1171 Race and Ethnic Relations: A World Perspective**4 QH**

Offers a cross-cultural analysis of race and ethnic relations in Western and non-Western societies. Examines race and ethnic relations in terms of contemporary developments, world problems, and ideological conflicts. (Formerly Comparative Race/Ethnic Relations).

SOC 1175 Sociology of Work**4 QH**

Examines the varieties of work in American society, from blue collar to managerial and professional occupations. Considers job dissatisfaction and professional burnout, changing shape of the labor market, women and work, participation and humanization of work, the impact of computers. (VI)

SOC 1176 Sociology of Business/Industry**4 QH**

Focuses on the role of industry in modern society. Examines similarities and dissimilarities among industrial societies, bureaucracy and its alternatives, unions, supervision democracy and manipulation, the worker on the assembly line, sabotage of the organization, and the role of wages and alienation.

SOC 1177 Social Roles in the Business World**4 QH**

Analyzes the social structure of corporate and business life in contemporary America. Presents and discusses case studies from major accounting and/or industrial firms. Examines the "career line" in the world of business and management, with a special focus on age/sex, racial/ethnic, and class/income barriers.

SOC 1178 Women Working**4 QH**

Discusses the fact that differences in the labor force experience of men and women workers

generally go unrecognized, and the work experience most common to women—household work—is rarely analyzed. Covers women's market and nonmarket activities, their rewards, and their problems, in addition to empirical and theoretical analyses of the work roles of women. Overall, underscores the differences between work experiences of men and women.

SOC 1180 Sociological Perspectives on Consumerism and Consumer Behavior 4 QH

Examines consumer-oriented issues, including interest groups, needs, values, institutional networks, decision-making processes, and situational impacts. Explores systemic benefits and costs of consumer-relevant actions.

SOC 1185 The Sociology of Deviance 4 QH

Explores the conditions under which people categorize others as different; processes by which persons so defined are assigned deviant status and assume appropriate roles and self-images; development of deviant careers and their relation to deviant subcultures; situations in which people transform deviant identity. (Formerly Social Deviance.)

SOC 1190 Juvenile Delinquency 4 QH

Examines the sociological and psychological approaches to and their implications for a typology of delinquency. Discusses problems of prevention, treatment, and rehabilitation.

SOC 1195 Drugs and Society 4 QH

Offers an introduction to the sociology of drugs. First examines social definitions of drugs, conditions of their use, and socialization into drug use. Then considers deviant drug use and effects of social control on definitions and use. Considers a range of licit and illicit drugs, but gives major emphasis to alcohol, marijuana, and heroin.

SOC 1200 Sociology of Alcoholism 4 QH

Focuses on social responses to deviant alcohol use. Examines drinking cultures and drinking practices in the United States; processes by which people are labeled "alcoholics"; and the role of agencies of social control, such as the criminal justice system and the health care system, in labeling and in rehabilitation.

SOC 1201 Alcohol Use and Social Control 4 QH

Examines the conditions under which alcohol use disrupts social life; the processes through which alcohol controls, informal and formal, come into being; the development changes and consequences of these controls. Includes case studies of Prohibition, regulation of the alcohol beverage industry, legal drinking age, drinking and driving, and public drunkenness.

SOC 1202 Sociology of Drinking 4 QH

Examines how different groups and societies organize drinking as a social act and the consequences of that organization. Singles out for particular attention the cultural meaning

assigned to drinking, the social elements found in all drinking situations, how members of social groups learn how to drink, and the social and psychological functions of drinking.

SOC 1205 Law, Crime, and Social Justice 4 QH

Analyzes the impact of the legal system on the creation and perpetuation of criminality in contemporary American society. Devotes particular attention to the study of the creation of criminal law, the judicial process, and the role of law in the gap between crime and social justice. Arranges field trips to criminal arraignments, trials, and sentencing in the Boston Municipal Court and Suffolk Superior Court. Suitable for students in prelaw, criminal justice, political science, and allied fields.

SOC 1206 Class, Crime, and the Police 4 QH

Summarizes the major psychological, social, biological, economic, and political theories about the cause of crime. Then applies these theories to the daily operations of the police, courts, and prison system in the United States. Examines various attempts to lower the crime rate through such policies as "scared straight" programs, the death penalty, stricter and looser prisons, increased police presence, and behavioral conditioning.

SOC 1215 Medical Sociology 4 QH

Examines the professions, training, institutions, and problems in health care, with an emphasis on those in the United States. Considers practical issues in the improvement of health care systems. *Prereq.* SOC 1100 or permission of instructor.

SOC 1217 Women, Health, and Social Change 4 QH

Examines how women have traditionally been viewed by the medical field and how reproduction and childbirth came to be defined as medical problems. Also examines the implications for women in the changes that have taken place in health care, especially as these pertain to new reproductive frontiers and alternative health care facilities. Discusses the role of women in the health care professions.

SOC 1225 Aging and Society 4 QH

Surveys issues and questions on aging, with special attention to social and economic consequences of the aging process, including retirement and productivity, health care problems, nursing home residences, widower- and widowhood, and the approach of death. Presents examples relating to aging in other cultures in a search for new answers to social problems of aging in the United States. Gives students the opportunity to learn to anticipate, cope with, and even prevent problems of aging that concern self, family, and clients/patients.

SOC 1235 Death and Dying 4 QH

Focuses on the treatment of death and dying, including problems faced by health care professionals, family members, institutions, the funeral industry, and the dying themselves. Discusses

cross-cultural perspectives, the social distribution of mortality, the changing nature of death, and the ethical problems in determining life and death with particular attention to such issues as abortion, suicide, and ceasing medical intervention. *Prereq.* SOC 1100 or permission of instructor.

SOC 1240 Sociology of Human Service Organizations 4 QH

Explores the contradiction between what human service organizations set out to do and what they actually accomplish. Also examines how the goals of human service organizations are defined, how clients become labelled, and the societal constraints on clients, workers, and human service organizations.

SOC 1245 Sociology of Poverty 4 QH

Analyzes American poverty in historical perspective, drawing on comparisons with other countries. Critically evaluates of sociological research and theories relating to poverty. Considers causes and effects of poverty, as well as societal responses to poverty and its consequences. Suitable for students in applied fields, such as nursing, criminal justice, education, allied health, pre-med, and pre-law.

SOC 1247 Food and Hunger 4 QH

Systematically examines the social causes and consequences of hunger and alternative approaches to solving world hunger.

SOC 1250 The Sociology of Private and Public Assistance 4 QH

Helps students understand why public and private assistance in the United States takes the form it does. Examines the ideology behind the welfare system, the kinds of assumptions made about the poor, how other countries deal with the problem, the effects of poverty in the United States, and some explanations for its continuing existence.

SOC 1255 Sport in Society 4 QH

Analyzes the social origins and functions of leisure activities, with special emphasis on games and sports as forms of leisure. Gives considerable emphasis to cross-cultural and historical analysis, as well as to the relation between leisure activities and various social institutions—economy, polity, family, and religion. (See SOA 1255.)

SOC 1275 Sociology of the Arts 4 QH

Examines the relation between the social organization of society and the forms of art produced—the social role of the artist, how the arts are “manufactured” and distributed, the art consumer’s relation to art and the artist, social support for the arts. Deals with a variety of art forms, with emphasis on the performing arts.

SOC 1276 Sociology of Popular Culture 4 QH

Presents a sociological analysis of popular culture, focusing on the relationship between pop culture and social institutions such as religion, the law, education, the economy, and the family; the

organizations and artistic communities that produce pop culture such as the music industry, theatrical groups, advertising agencies; and the social roles and socialization processes associated with individual artists. Examines changes in popular culture from the viewpoint of changes in the larger society.

SOC 1284 Technology and Careers of the Future 4 QH

Focuses on new technologies and their social impacts on work and careers in the future. Examines sociological and humanistic approaches to technical change in the shop floor, offices, and professions. Also covers issues of design and control, health, employment, and autonomy.

SOC 1285 Technology and Society 4 QH

Discusses the following questions: Does society control technology or is technology directing society? Has technology become dehumanized? How valid is the doctrine of technological inevitability? Can the technological “fix” be viewed as a solution to social problems? Is technology itself a social problem? What can be expected of technology assessment? What of the back-to-nature and antitechnology movements today: are they the waves of the future? Expects students to do considerable independent study and research.

SOC 1287 Society Tomorrow: Forecasting Alternative Futures 4 QH

Introduces students to the area of “social futures” or “future studies.” Examines the major techniques used to forecast futures and the specific scenarios and projections about the social world of tomorrow. Using the areas of energy and resources, robotics and the “information revolution,” as well as modern weaponry and warfare, considers the major prospects and problems for society in the future.

SOC 1290 Military and American Society in a Nuclear Age 4 QH

Acknowledges that keeping out of war, winning war, and keeping peace have been major concerns during the past forty-five years. Investigates the relationship between military and society. Covers selected issues, including the impact of the military on social institutions such as the family, polity, and economy, the arms race and upheaval in social life, the legitimization crisis of the United States military, the role of women and minorities as reserve armies, and military spending and domestic social problems.

SOC 1300 Classical Social Thought 4 QH

Traces the development of sociology from the history of social thought. Examines the emergence of several schools, beginning with positivistic organicism and conflict theory. *Prereq.* Three sociology/anthropology courses.

SOC 1301 Current Social Thought 4 QH

Offers a seminar-lecture in which formalism, social behaviorism, social action theory, and

functionalism are studied critically. *Prereq.* Three sociology/anthropology courses.

SOC 1302 Female Perspectives on Society 4 QH

Examines a sampling of the burgeoning feminist literature in the social sciences and in theory, focusing on at least three major tendencies in this literature: radical feminism, socialist feminism, and neo-Freudian feminism. Discusses specific topics, including the origins and/or universality of women's oppression, women's work under capitalism, socialism and women's liberation, and family structure and the reproduction of gender. (VI)

SOC 1310 Class, Power, and Social Change 4 QH

Focuses on theories of social equality and inequality as applied to the exercise of power and large-scale social change. Required of majors. (V) *Prereq.* SOC 1100 and middler standing or permission of instructor.

SOC 1320 Introduction to Statistical Analysis 4 QH

Examines the application of the principles of measurement, probability, measures of centrality, tests of significance, and techniques of association and correlation to social data. *Prereq.* SOC 1100 or permission of instructor.

SOC 1321 Research Methods I 4 QH

Introduces students to the research process through an examination of the rules of evidence in empirical research and the place of values. Gives students the opportunity to learn how to design and critique types of sociological research, how to collect qualitative and quantitative data, and how to sample populations. *Prereq.* SOC 1100 and SOC 1320, or permission of instructor.

SOC 1322 Research Methods 2 4 QH

Requires students to complete the research project begun in SOC 1321. Focuses on practice coding, building indexes, scaling, table construction; introduction to use of the computer. *Prereq.* SOC 1100, SOC 1320, and SOC 1321, or permission of instructor.

SOC 1324 Human Services Research and Evaluation 4 QH

Covers basic issues in applied research and the evaluation of services, including the purposes of evaluation, ethics, formulating questions and measuring answers, designing evaluations and planning oriented research, utilizing evaluation results, and the turbulent setting of action programs. Suitable for students majoring in human services, sociology, psychology, nursing, health education, and related fields. *Prereq.* SOC 1320 or other statistics, SOC 1240, or permission of instructor.

SOC 1335, SOC 1336 Group Behavior 1, 2 4 QH each

Explores how individuals interact in groups and how groups interact with each other. Focuses on the reflexive self, social aspects of language, situational learning, group perspectives, careers, institutions, and worlds.

SOC 1345 American Demographics 4 QH

Offers an applied research experience in which students have the opportunity to study the major areas of demography. Focuses on the resources of the United States Census Bureau and, in particular, the data products available from recent census surveys.

SOC 1347 Community Analysis 4 QH

Explores types of human settlements, focusing on the interaction between people and their political, economic, and social environments. Discusses power structure and citizen action to influence institutions; skills in community analysis, including use of documents, survey, observation, and evaluation of needs and resources; strategies of conflict, cooperation, and negotiation to attain community and group ends. *Prereq.* Permission of instructor or three sociology/anthropology courses.

SOC 1348 Seminar in Urban Studies 4 QH

Compares interdisciplinary approaches to urban studies according to problem areas and research methods. Gives students the opportunity to extend previous term paper projects after exposure to social action and social systemic theoretical perspectives. *Prereq.* SOC 1147 or permission of instructor.

SOC 1365 Collective Behavior 4 QH

Focuses on the rise of new group forms in response to persistent social unrest; masses, crowds, and publics; specific instances of collective behavior such as race riots, wildcat strikes, prison revolts, and campus disorders.

SOC 1375 Sociology of Occupations and Professions 4 QH

Focuses on the meanings of work; division of labor and specialization; analysis of occupational structure and patterns of recruitment, training, and career preferences; the classic professions and new trends in professionalization. *Prereq.* Permission of instructor or four sociology/anthropology courses.

SOC 1376 Organization and Bureaucracy 4 QH

Focuses on sociological study of organizations. Examines case studies of private corporations, federal bureaucracies, social service agencies, military-industrial complex, high-risk technological systems, unions. Analyzes recent theories of innovation, participation, and opportunity in complex organizations.

SOC 1385 Social Deviance 2 4 QH

Examines the leading theories of deviance (anomie, subcultural deviance, labeling) and their principal variants; studies their assumptions, conceptions, propositions, and supportive evidence; analyzes empirical studies in each theoretical tradition.

SOC 1470 Sociology of Religion 4 QH

Offers a comparative and analytic treatment of religion as a social institution, focusing on the relations between religious organizations and

other social institutions, with particular emphasis on the American experience. Analyzes religion as an agent of social change and stability. *Prereq.* SOC 1100.

SOC 1475 The Sociology of Mass Communication 4 QH

Focuses on factors in the formation and development of public opinion, the effect of television on children, mass communication as social organization, media-depicted images of society, the role of personal influence, the process of rumor, the use of mass media by the poor, propaganda analysis, and the latent and manifest functions of mass communication.

SOC 1485 Computers and Society 4 QH

Examines the impact of the computer revolution on the conditions of work and life in contemporary society including legal and theoretical issues. Discusses ethical and professional issues in computer use. (VI) *Prereq.* Junior in computer science or middler with ability to program.

SOC 1500 Applied Sociology: Practice and Theory 4 QH

Analyzes the conditions under which sociological knowledge is applied to social problems, the kinds of problems, and the degree of effectiveness of this application. Pays particular attention to research and demonstration projects that derive from sociological theory.

SOC 1501 Social Policy and Social Intervention 4 QH
(Formerly Social Control 2)

Focuses on study of the formation of social policies in response to social problems; analyzes policies and problems, supporters and opponents of policy change, conditions under which control agencies adopt new policies, and effects of policy change. Places particular emphasis on case studies of social action and legal change.

SOC 1525 Comparative Human Services 1 6 QH

Offers an intensive look at the American human services system. Gives upper-level undergraduate

and graduate students the opportunity to study the origins, development, and present state of human services in the United States. Involves lectures as well as field visits in the Boston area. Provides independent study.

SOC 1526 Comparative Human Services 2 6 QH

Offers an intensive study of the British human services system. Provides students the opportunity to immerse themselves in the social and cultural context of British human services and involves field trips in London designed to examine firsthand the planning, administration, and delivery of human services in Great Britain.

SOC 1535 Seminar in Social Welfare 4 QH

Discusses problems in social welfare observed in the term between "Problems" and "Practicum." Requires a research paper, based on directed field-work in the intervening term.

SOC 1601 Seminar in Current Emphases in Sociology 4 QH

Reviews and discusses selected sociological topics. *Prereq.* Junior or senior standing in sociology/anthropology or permission of instructor.

SOC 1700 Introduction to Sociology (Honors) 4 QH

Honors equivalent of SOC 1100.

SOC 1710 Class, Power, and Social Change (Honors) 4 QH

Honors equivalent of SOC 1310. Any Honors Program member is eligible to enroll in this course.

SOC 1800, SOC 1801, SOC 1802, 4 QH each
SOC 1803 Directed Study

Offers independent work on a chosen topic under the direction of members of the department. Limited to qualified students with approval of department chair. *Prereq.* Junior or senior standing in sociology or permission of instructor.

Speech Communication

Some courses in the College of Arts and Sciences are duplicated in different departments or colleges or within a department. You may not receive credit for two such courses. If you have a question about whether one course overlaps another, please consult the departments involved and the Office of the Dean before taking the course.

Numbers inside parentheses within course descriptions refer to core curriculum categories listed on page 3.

SPC 1110 Voice and Articulation 4 QH
Focuses on voice technique. Emphasizes pitch, projection, articulation, and vocal variety. Combines theory and practical application.

SPC 1111 Oral Interpretation 4 QH
Focuses on application of basic vocal techniques to the dramatic reading of prose, poetry, and drama. Discusses that, through literary analysis, the author's meaning is understood and, by means of oral reading skills, communicated to an audience.

SPC 1115 Introduction to Communication Skills 4 QH
Focuses on the communication process and its function as a means of relating to the world, ourselves, and other people. Examines factors in intra- and interpersonal communication, group communication, and public speaking through lectures, discussions, structured learning experiences, and written assignments.

SPC 1116 Business and Professional Speaking 4 QH
Focuses on practice of oral presentations, group communication, conference and discussion techniques, interview methods, and occasion speaking. Combines performance aspects with case study methods of communication on the professional level.

SPC 1210 Advanced Voice and Articulation 4 QH
Develops and applies vocal techniques acquired in SPC 1110. Emphasizes on vocal analysis, flexibility, and regional patterns of speech. *Prereq.* SPC 1110 or permission of instructor.

SPC 1211 Advanced Oral Interpretation 4 QH
Provides the opportunity to develop further oral reading skills acquired in SPC 1111. Includes work with accents and dialects, study of reader's theatre, and an investigation of classical and modern philosophies of the art. *Prereq.* SPC 1111.

SPC 1232 Communication and Gender 4 QH
Reviews literature on differences in language use between genders. Topics include speech and gender, stereotyping and symbol using, and speech and reality. Offers the opportunity to develop greater sensitivity to the way we define ourselves through speech and interaction.

SPC 1239 Argumentation and Debate 4 QH
Helps develop skills in rational decision making through advocacy. Gives attention to logical reasoning, psychological methods, and motivational techniques. *Prereq.* SPC 1115, SPC 1116, or permission of instructor.

SPC 1240 Competitive Strategies in Oral Communication 4 QH

Focuses on teaching and coaching techniques in intercollegiate speech competition. Concentrates on speech researching, writing, and criticism. Encourages students involved in speech competition or those studying fields that require competence in presentational skills. *Prereq.* SPC 1115 or permission of instructor.

SPC 1250 Introduction to Mass Communication 4 QH
Explores the many media through which people express themselves: radio, television, film, print, music. Pays attention to the role of the individual as a media consumer.

SPC 1300 Introduction to Communication Theory 4 QH
Offers basic knowledge and understanding of the processes involved in the transference of meanings. Discusses the problems involved in defining communication and the nature of communication. Examines various models of communication. Considers the nature of theory and requirements of adequate theory. Examines various theories of human communication, including psychological, sociological, information, and system theories.

SPC 1310 Rhetorical Theory 1 4 QH
Examines various theories of rhetoric, starting with the early Greeks (Plato's "Phaedrus" and "Gorgias," Aristotle's "The Rhetoric"), progressing through the rhetoric of Rome (Cicero's "de Brute" and Quintilian's "de Institutione"), and moving into a brief synopsis of medieval rhetoricians (Peter Ramus, Thomas Wilson, Thomas de Quincey, Francis Bacon, George Campbell, Richard Whately). Focuses on the student's growing knowledge and appreciation of the history and principles of rhetoric, which are the foundation of oral discourse. *Prereq.* SPC 1115 and SPC 1250.

SPC 1315 Theories of Persuasion 4 QH
Surveys theoretical and conceptual approaches and research pertaining to the effectiveness of communication that is intended to induce deliberately changes in attitudes, beliefs, values, or behavior.

SPC 1317 Theories of Audience Behavior 4 QH
Surveys theoretical models, concepts, and research. Focuses on the role of the receiver as an active participant in the communication process. Considers individual information processing; listening as a learned behavior; intra-audience

effects; relations between media and audience characteristics; dissemination, rumors, and information; and the development of societal norms and mores.

SPC 1318 Negotiation Skills 4 QH

Investigates the skills involved in bringing matters to mutually acceptable settlements; applies those skills through lectures, discussions, and especially through performance in case studies and role-playing simulations. Includes such personal, professional, and governmental processes as conflict resolution, problem solving, and advocacy. Places particular emphasis will be placed on the collective bargaining process in the private and public sectors, including negotiation, mediation, and arbitration. *Prereq. Middler standing or higher or permission of instructor.*

SPC 1330 Interpersonal Communication 1 4 QH

Focuses on the communication process. Examines the ways in which we relate to other individuals and factors that influence these processes.

SPC 1331 Interpersonal Communication 2 4 QH

Focuses on application of concepts developed in SPC 1330. As an experiential course, explores ways of becoming more aware of one's self and one's relationships with others and examines various options for communicating and increasing knowledge of the group process. Enrollment limited. *Prereq. SPC 1330 or permission of instructor.*

SPC 1338 Group Discussion 4 QH

Expects students to work in task groups to explore theory and research in the area of group dynamics and to apply their knowledge to the classroom experience as they work on developing skills in decision making, problem solving, membership, and leadership.

SPC 1410 Contemporary Public Address 4 QH

Offers a critical study of the public address skills of leading contemporary speakers representative of important political and social movements. Helps students gain an appreciation of the dimensions and varieties of contemporary public address, broadly defined as symbolic discourse. Analyzes various theories and approaches to public address, examines rhetorical situations; critically evaluates the use of agitative and control strategies to accomplish social change.

SPC 1415 Persuasive Techniques 4 QH

Offers a critical, in-depth analysis of instances of persuasion as they occur in social interaction, social movements, politics, and advertising; the practical strategies employed; and the factors that influence the effectiveness of those strategies when persuaders attempt to influence others. *Prereq. SPC 1315 or permission of instructor.*

SPC 1430 Organizational Communication 1 4 QH

Examines the nature of communication in the context of complex organizations. Explores both internal and external organizational communication.

Analyzes communication networks, communication technologies, interpersonal communication modes, organizational interdependencies, and their effects on information transfer and diffusion. Includes a section on organizational communication assessment and communication program implementation. *Prereq. SPC 1250.*

SPC 1431 Organizational Communication 2 4 QH

Explores advanced applications of mass communication to organizational communication problems. Reviews the principles of mass communication and organizational communication and evaluates different message diffusion strategies used in organizations. Includes problem analysis and student presentation. *Prereq. SPC 1250 and SPC 1430.*

SPC 1437 Consultation Skills 4 QH

Gives students the opportunity to acquire the skills necessary to analyze communication difficulties in industry, organizations, and groups. Includes theory discussion, practice, and feedback, using case study method. *Prereq. SPC 1115, SPC 1300, SPC 1330, and SPC 1338.*

SPC 1450 Television 1 4 QH

Introduces the student to the equipment of a broadcast studio, surveys broadcast production techniques, and provides opportunities in class for applied practice through the production of programming suitable for broadcast. *Prereq. SPC 1250 or permission of instructor.*

SPC 1451 Foundations of Broadcasting 4 QH

Surveys the history, technology, and governmental regulation of broadcasting in the United States, as compared to other systems internationally. Describes the evolution of the medium, beginning with the "wired" communication systems of Bell and Morse, the use of radio first for point-to-point communication and its growth into a mass medium, and finally, the post-World War II explosion of the television industry. Focuses on major personalities—inventors, corporation founders, and political leaders. Examines quarrels and resolutions in the context of the historical and contemporary state of the broadcasting industry. *Prereq. SPC 1250.*

SPC 1452 Radio 1 4 QH

Focuses on the role of the producer/director in the creation, preproduction planning, and execution of local and network radio programs. Emphasizes live broadcasts and live assembly of partially pre-recorded programs. Spends a great deal of time on the written materials necessary for program planning. Also spends some time in the studio working on model program production and, possibly, actual live music performance broadcasts. *Prereq. Permission of instructor.*

SPC 1453 Broadcast Management 4 QH

Examines four key areas that inform management practices: economics, FCC regulatory policies, external marketplace forces (competition), and

internal organizational forces (people). Applies this understanding of contemporary management practices to case studies. *Prereq.* SPC 1250 and *middler status or above.*

SPC 1454 Programming for Radio and Television 4 QH

Focuses on the structure in which the programmer operates and the motivation for programming strategies. Examines practical components of the marketplace, such as ratings, public TV, contemporary radio, and deregulation. *Prereq.* SPC 1250 and *middler status or above.*

SPC 1455 Television 2 4 QH

Examines the history of the business of the television industry and endeavors to sharpen each student's ability to solve and criticize complex creative problems. Expects students to write convincing program treatments, analyze audience data, become well versed in current issues in the industry, and finish at least two television pieces. *Prereq.* SPC 1250 and SPC 1450.

SPC 1500 Special Topics in Speech Communication 4 QH

Offers an in-depth examination of a subject of particular significance to the field. *Prereq.* Permission of instructor.

SPC 1554 Special Topics in Broadcasting 4 QH

Introduces the student to the variety of roles played by broadcast professionals and to the interplay of professional functions integral to the broadcast industry. Focuses on a different aspect of the broadcast industry each term. *Prereq.* SPC 1250 or permission of instructor.

SPC 1555 Communication and the Quality of Life 4 QH

Offers students an opportunity to develop a meaning of the concept "quality of life" and to gain

knowledge of subjective and objective methods for measuring and assessing that concept. Identifies, explores, and analyzes problems in professions that influence quality of life; evaluates possible solutions.

SPC 1600 Introduction to Communication Research 4 QH

Focuses on scientific method and epistemology as they apply to the investigation of communication phenomena. Assists students in finding and critically evaluating literature dealing with factors that influence the effectiveness of communication and that may be pertinent to either academic projects or managerial decision-making. *Prereq.* SPC 1300 or permission of instructor.

SPC 1610 Rhetorical Criticism 4 QH

Focuses on the principles of rhetorical analysis: theories, methods, and their application to discourses. Studies various types of discourse throughout the quarter. Pays attention to understanding various methods and problems in rhetorical analysis. Examines judgment criteria, as well as the role of rhetorical criticism in society. (V) *Prereq.* SPC 1310.

SPC 1890, SPC 1891, SPC 1892 4 QH each
Directed Study

SPC 1895, SPC 1896 Internship in Speech Communication 4 QH

Provides students with the opportunity to gain academic credit for on-the-job training in an allied career field. Requires prior approval by a department committee, demonstration that the job allows opportunities to apply theoretical understanding to specific application in the work environment, and faculty advisement as well as on-the-job supervision.

Theatre

Numbers inside parentheses within course descriptions refer to core curriculum categories listed on page 3.

DRA 1100 Introduction to Theatre Arts 4 QH

Provides a brief view of the historical development of acting, directing, and production design. Emphasizes appreciation of contemporary theatrical forms. (II)

DRA 1106 Theatre History 1—Beginnings to Renaissance 4 QH

Explores the history of the theatre and its development in the West, focusing on Greece, Rome, Medieval Europe, Golden Age Spain, and Elizabethan and Stuart England. (Can be taken independently of DRA 1107.)

DRA 1107 Theatre History 2—Renaissance to Naturalism 4 QH

Focuses on the development of theatre in the Italian Renaissance; the spread of Italianate forms throughout Europe during the seventeenth

and eighteenth centuries; the rise of Romanticism in Germany and its spread; and the rise of realism and naturalism in France, Scandinavia, and throughout Europe. (Can be taken independently of DRA 1106.)

DRA 1112 Drama Theory/Criticism 4 QH

Examines the major historical statements of drama theory and contemporary drama criticism as evidenced in journalistic play reviews. Requires students to prepare reviews of local productions.

DRA 1114 Masters of the Theatre 4 QH

Overviews several great practitioners of theatre. In particular, stresses how society influenced the thought and craft of playwrights, actors, directors, designers, and theorists. Pays careful attention to how the play's ideas are translated into

performance. Uses video and live performance, when possible, as integral elements in the course. (III)

DRA 1116 The American Theatre 4 QH
Focuses on the American theatre from the Revolutionary War to the present.

DRA 1118 Black Theatre in America 4 QH
Surveys the history of black theatre artists in America from the time of Ira Aldridge to the present day. Also examines the works of black playwrights from the Harlem renaissance to the present, with an emphasis on the period beginning with Baraka's *Dutchman*.

DRA 1121 Contemporary Theatre 4 QH
Examines the current state of commercial, regional, and other noncommercial theatre in the United States, using readings, lectures, reports, and weekly visits to theatre productions in the area. Explores through lectures the background of these types of theatre in twentieth century American and European theatre.

DRA 1124 The Irish Theatre 4 QH
Focuses on theatre and drama in Ireland from their beginnings to the present, with the backgrounds of Irish folklore and history. Emphasizes developments in the twentieth century.

DRA 1125 The Theatre of the Absurd 4 QH
Focuses on the theatre of the absurd as an anti-literary reflection of and reaction to life and its effects on Western drama. Focuses on selected works and ideas of Jarry, Artaud, Camus, Sartre, Beckett, Genet, Ionesco, Pinter, Kopit, Brown, and Arrabal.

DRA 1127 The Comic Theatre 4 QH
Surveys theatrical comedy from the ancient Greeks to the present. Examines the comic playwright, the "joke writer," the comic director, the comedic actor, and the standup comedian. Discusses theories and techniques of laughter, as well as the psychological and sociological benefits derived from laughter. Includes reading playscripts by Aristophanes, Molière, Shakespeare, Shaw, and Simon as well as viewing and listening to tapes of Chaplin, the Marx Brothers, and others. Examines comedy devices through lectures, films, records, and attending live performances.

DRA 1140 Playwriting I 4 QH
Emphasizes the principles and practices of modern dramatic composition: characterization, plot, plot structure, dialogue, and other dramaturgical elements as seen in the one-act play. Includes the writing of brief scenes, the dramatic composition, and the one-act play.

DRA 1149 Script Analysis for the Stage 4 QH
Aids the theatre practitioner in developing the skills necessary for analyzing scripts in preparation for production. Focuses on dramatic theory and structure and theatrical techniques that will enable an actor, director, designer, or playwright

to uncover the problems of translating theory into practice.

DRA 1150 Introduction to Acting 4 QH
Focuses on fundamental techniques of stage use, the actor and the stage environment, and improvisations for strengthening imagination and increasing freedom. Analyzes scripts for work on performed scenes.

DRA 1155 Voice for the Theatre 4 QH
Focuses on vocal exercises that enable the actor to better connect with the voice through freeing the physical and emotional self. Emphasizes centering, physicalization, breath support, articulation, resonance, projection, and relaxation. Includes selected monologues and/or scenes for classroom analysis.

DRA 1160 Movement I 4 QH
Emphasizes using the body as an expressive instrument for Realism. Develops concentration, control, and stamina through exercise, relaxation, improvisation, manipulation of energy flow, rhythms, and imagination. *Prereq.* Theatre major or permission of instructor.

DRA 1180 Concepts of Direction 4 QH
Examines theories of dramatic presentation through analysis of selected historical developments. Focuses on purposes and techniques of theatrical direction related to script analysis, production style, pictorial composition, rhythmic evolution, and emphatic responses. *Prereq.* DRA 1150 and DRA 1212.

DRA 1200 Stagecraft 4 QH
Focuses on principles that underlie the coordination and execution of technical production. Examines different kinds of scenery, tools, equipment, construction materials, and lighting techniques. Lab work involves preparing technical elements of University productions.

DRA 1209 Theatrical Drafting 4 QH
Through work on supervised classroom projects, exposes the student to the basic graphics language needed to translate a designer's ideas into technical drawings used for construction. *Prereq.* DRA 1200.

DRA 1210 Scenic Design for the Stage 4 QH
Introduces the theory and practice of theatrical design and the role of the designer in the production process. Through project work, examines the use of the graphics tools—line, form, balance, color, rhythm, etcetera—in the development of the design idea. Emphasizes understanding and utilizing spatial relationships, visually expressing conceptual themes, and understanding the various uses, problems, and practical considerations of proscenium, thrust, and arena staging. Analyzes historical production styles from the Greco-Roman period through the nineteenth century. *Prereq.* DRA 1200, DRA 1212, or permission of instructor.

DRA 1212 Introduction to Theatrical Design 4 QH

Introduces the visual effects of modern theatrical production and the creative processes by which these come into being, through a basic survey of the three major design disciplines, their supporting technology, and their working interrelationship. Addresses the questions of how artistic concepts are developed and related, how they are communicated to other artists and an audience, and how one develops the critical processes necessary to evaluate these concepts.

DRA 1213 Scene Design 2: Principles 4 QH

Focuses on the development and expression of conceptual statements from specific dramatic texts through a series of exercises involving script analysis and introductory work in rendering and model construction. Examines texts selected from works of distinct historical and stylistic periods. Studies the heritage of twentieth-century theatrical design through the work of artists such as Appia, Craig, Jones, Urban, and Oenslager. Emphasizes the development of such stylistic treatments as realism, expressionism, symbolism, and constructivist and environmental design.

Prereq. DRA 1210.

DRA 1225 Scene Painting 4 QH

Traces the history of scene painting and ornament from classical to contemporary times. Focuses on studio organization, color, color theory, equipment, tools, materials, and costs involved with painting stage scenery. Uses projects and exercises in the use of different media, matching colors, painting of textures, light and shade, and the use of stencils and physical textures. Includes lab sessions involving painting stage scenery for University productions. *Prereq.* DRA 1200 or permission of instructor.

DRA 1226 Lighting Design for the Stage 4 QH

Examines basic principles and practices of stage lighting, including the qualities and functions of light, lighting instruments and controls, basic electricity, color in light, and analysis of the script in terms of light requirements. Expects students to develop light plots and schedules for various kinds of stage productions. Includes lab work on lighting crews for University productions. *Prereq.* DRA 1200, DRA 1212, or permission.

DRA 1246 Sound for the Theatre 4 QH

Beginning with a basic introduction to both natural and electronically produced sound, goes on to discuss the component parts of sound systems, their theories, and their applications. Discusses and demonstrates techniques of recording and editing, with particular reference to the creation of sound tracks and effects for theatrical productions. Explores the concepts of sound-reinforcement systems for musicals, concerts, and other current professional applications.

DRA 1261 Costuming I 4 QH

Presents the beginning designer with the opportunity to investigate costume design theory and to foster perceptual development. Through lectures and projects, gives students the opportunity to explore both the abstract and historical aspects of costume design as well as textual analysis and its conceptual implications. (Does not require prior art or design education.)

DRA 1265 Pattern Drafting and Costume Construction 4 QH

Develops the skills and techniques necessary for the patterning, cutting, and construction of costumes for the stage. Covers flat pattern drafting, draping, and finishing techniques.

DRA 1280 Stage Makeup 4 QH

Focuses on the principles of, the reasons for, and the materials used in makeup for the theatre, television, and films. Includes the practical application of types and styles of makeup—straight, old-age, character, and corrective.

DRA 1284 Theatre Management 4 QH

Focuses on theatre management, including problems of financing, promoting, and programming for educational, community, profit, and nonprofit professional theatre.

DRA 1292 Children's Theatre 4 QH

Focuses on theories and methods of creative techniques related to children's programs in schools, churches, and recreational facilities. Analyzes literature in preparation for production of children's plays.

DRA 1300 Acting 2 4 QH

Focuses on developing the actor's sense of truth and emotional freedom. Emphasizes creating, developing, and sustaining character and developing ensemble. Includes monologues and scenes performed for classroom analysis. *Prereq.* DRA 1150 or permission of instructor.

DRA 1301 Acting 3 4 QH

Focuses on further development of the actor's tools, script and character scoring, and exercises for physical and psychological freedom. Includes in-class scenes from works in progress. *Prereq.* DRA 1300.

DRA 1302 Acting 4 4 QH

Deals with scene work from a spectrum of theatrical genre. Focuses on developing a technique for approaching a role through research, character, and language. *Prereq.* DRA 1301 or permission of instructor.

DRA 1316 Acting for the Camera (Television) 4 QH

Presents the fundamentals of camera acting, adjusting the actor's physical responses to the mechanical eye of the camera and the delicate ear of the microphone. Involves studio work before the

television camera to explore the genres of dramatic, commercial, and industrial acting. *Prereq.* **DRA 1150, DRA 1155, DRA 1160, DRA 1300, DRA 1301, and DRA 1302.**

DRA 1325 Musical Theatre Technique 4 QH

Applies acting technique to the performance of musical material. Explores song through text and character progression, develops a process for approaching a song, and synthesizes movement, gesture, and emotion with melody, rhythm, and lyrics. Involves student performances of solo, small ensemble, and large ensemble material. Does not involve singing technique. *Prereq.* **DRA 1150, DRA 1300, or permission of instructor.**

DRA 1370 Rehearsal and Performance 4 QH

Allows students to participate in public performance through preparation and rehearsals in areas of acting, directing, design, and stagemanaging. *Prereq.* *Permission of instructor.*

DRA 1400 Costuming 2 4 QH

Offers advanced study in textual interpretation and its application to costume design. Emphasizes conceptual and stylistic development through assigned projects in the various genres of the performing arts. *Prereq.* **DRA 1261 or permission of instructor.**

DRA 1410 Technical Production 4 QH

Allows the opportunity to acquire and explore the requisite skills for developing working drawings and budgetary analyses for theatrical productions. Focuses on several projects and includes the opportunity to coordinate one substantial production. Requires that the specialized study be executed in close supervision with the instructor. *Prereq.* *Completion of all courses stipulated in production / design concentration and permission of instructor.*

DRA 1420 Advanced Drafting and Construction 4 QH

Offers specialized study in technical production techniques. Covers drafting procedures necessary for the conversion of designer's drawings into detailed rear elevation and construction layouts, as well as the development of section, isometric, and oblique views. Through a series of practical and project exercises, analyzes the various factors governing the construction and rigging of two- and three-dimensional scenery, linear-motion, rotary-motion, and elevating

systems. Emphasizes theatrical problem solving with regard to safety, dependability, and economy. Lab fee. *Prereq.* **DRA 1209.**

DRA 1430 Lighting Design 2 4 QH

Offers an intensive study of lighting design theory and practice. Expects students to design numerous lighting plots, sections, instrument schedules, and design concepts for various types of productions and spaces. Investigates and discusses current professional techniques and practices. *Prereq.* **DRA 1226.**

DRA 1505 Continental Drama 4 QH

Covers seminal late nineteenth- and mid-twentieth-century continental drama. Focuses on playwrights whose plays had a major impact on modern drama and theatre.

DRA 1510 Twentieth Century Theatre 4 QH

Studies the history of the post-naturalistic theatre in Europe and the United States. Explores the work and influence of such figures as Craig, Appia, Meyerhold, Brecht, Artaud, Grotowski, Beck and Molina, Schechner, and Chaiken.

**DRA 1800, DRA 1801, DRA 1802, DRA 1803 1 QH each
Practicum in Production**

Offers lab practice in technical production; can be repeated for credit (maximum four credits). *Prereq.* *Departmental permission.*

**DRA 1820, DRA 1821, DRA 1822, 4 QH each
DRA 1823 Directed Study**

**DRA 1840, DRA 1841, DRA 1842, 4 QH each
DRA 1843, DRA 1844, DRA 1845, DRA 1846,
DRA 1847, DRA 1848, DRA 1849**

Special Topics in Theatre/Dance Performance

Offers opportunity for in-depth examination of a subject of particular significance to the field.

**DRA 1860, DRA 1861, DRA 1862, DRA 1863, 4 QH each
DRA 1864, DRA 1865, DRA 1866,
DRA 1867 Special Topics in Theatrical Design**

Offers opportunity for in-depth examination of a subject of particular significance to the field.

**DRA 1890, DRA 1891, DRA 1892, DRA 1893 4 QH each
Special Topics in
Theatre History/Dramatic Criticism**

Offers opportunity for in-depth examination of a subject of particular significance to the field.

Accounting

ACC 1111 Accounting Principles 1

4 QH

This first of a series of accounting courses assumes students do not possess knowledge of the subject. Both this course and ACC 1112 are designed to help provide an understanding of accounting issues and objectives for proper interpretation and analysis of financial data. Specific topics covered in this first course are the nature, function, and environment of accounting; the basic accounting model; financial and analytical ratios; the accounting cycle; accounting for merchandising entities; and the control of cash and receivables. *Prereq. Sophomore standing.*

ACC 1112 Accounting Principles 2

4 QH

In this second of a series of courses, students are introduced to financial and managerial accounting decisions through class discussions, short exercises, and demonstration problems. Specific topics covered include control of inventory; acquisition, depreciation, and disposal of plant and equipment; paid-in capital related to sole proprietorships, partnerships, and corporations; short- and long-term debt financing; the analysis and interpretation of financial reporting; and the statement of changes in financial position. *Prereq. ACC 1111 and sophomore standing.*

ACC 1330 Cost Accounting for Management

4 QH

Examines cost accounting from a managerial viewpoint. Stresses the impact of quantitative and behavioral aspects on budgets and cost control is stressed. Designed specifically for management majors. *Prereq. ACC 1112 and middler standing.*

ACC 1331 Intermediate Accounting 1

4 QH

The principal foundation course for accountants begins with a comprehensive review of basic accounting principles, operations, and financial statements. Development of accounting theory is stressed in the analysis of alternative treatments and procedures. Specific areas receiving intensive treatment are cash, accounts receivable, inventories, and current liabilities. *Prereq. ACC 1112 or equiv. and middler standing.*

ACC 1332 Intermediate Accounting 2

4 QH

This course is a continuation of the study of accounting principles, concepts, and procedures introduced in ACC 1331. Specific topics emphasized are long-term assets, depreciation, stockholders equity, and EPS. *Prereq. ACC 1331 and middler standing.*

ACC 1339 Cost Accounting 1

4 QH

Examines cost determination and use. Special consideration given to manufacturing concerns. Specifically covers cost behavior, relevant costs, performance evaluation, budgets, and standard costs. *Prereq. ACC 1112 and middler standing.*

ACC 1340 Cost Accounting 2

4 QH

Continuation of ACC 1339. Focuses on the use of cost data in decision making, budget planning, and the control process. *Prereq. ACC 1339.*

ACC 1343 Intermediate Accounting 3

4 QH

Completion of the study of basic accounting concepts and special areas of concern to modern accounting practice. Studies leases, pensions, accounting changes, income tax accounting, changes in financial position, price-level and current-value accounting. *Prereq. ACC 1332.*

ACC 1345 Accounting Systems

4 QH

Examines the process of designing financial and managerial accounting systems. Uses a conceptual approach and considers the appropriate use of computer technology in designing new systems. Assumes an understanding of accounting processes in both financial and managerial areas. *Prereq. Middler standing.*

ACC 1347 Auditing

4 QH

Examines audit concepts, standards, and procedures, including the auditor's legal and ethical responsibilities, for students who plan to enter the public accounting profession. Emphasizes concepts rather than procedures. Specifically covers auditing standards, auditor's reports, internal control, statistical sampling, electronic data processing (EDP), and legal liability. *Prereq. ACC 1343.*

ACC 1351 Federal Income Taxes 1

4 QH

Emphasizes basic understanding of the federal income tax structure relating to individuals rather than corporations. Requires completion of several research cases directed at solving various tax problems. Through case studies, introduces the current Internal Revenue Code, income tax regulations, and cumulative bulletins. Discusses tax-court cases and various private company publications. *Prereq. ACC 1343.*

ACC 1505 Internal Auditing

4 QH

Helps students understand how the internal auditor undertakes a review and appraisal of operations. Focuses on the internal audit environment, preparation of long-range programs, performance of preliminary surveys, flowcharting, development of audit programs, sampling, audit techniques, and reporting. Case-study oriented. *Prereq. Middler standing.*

ACC 1512 Federal Income Taxes 2

4 QH

This course is a continuation of ACC 1511. Topics include taxpayers other than individuals and the treatment of property transfers that are subject to federal, gift, estate, and trust taxes. Tax research

is an important element of this course. A major emphasis is given to tax planning considerations, especially to gift and death tax consequences.

Prereq. ACC 1511.

ACC 1521 Advanced Accounting Problems 4 QH

This course is an in-depth analysis of various accounting topics for the student planning a career as a professional accountant. Topics covered are government and not-for-profit accounting; partnerships; installment sales; consignments; segment and interim reporting; foreign currency accounting; troubled-debt restructurings; and liquidations, estates, and trusts. *Prereq.* ACC 1343.

ACC 1522 Advanced Accounting for Business Combinations 4 QH

This course is a comprehensive analysis of the accounting theory and practice associated with corporate acquisitions and combinations. Topics include methods of consolidation-elimination of profits on intercompany transactions, purchase versus pooling of interests, and accounting for good will. The course is intended for the serious student preparing for a career as a professional accountant. *Prereq.* ACC 1343 or permission of instructor.

ACC 1526 Management Accounting 4 QH

Examines the role of the management accountant. Studies relation between financial and managerial accounting, design and use of accounting and control systems, measurement techniques and uses, the role of behavior in accounting, performance evaluation, and other topics of current interest. *Prereq.* ACC 1349.

ACC 1535 Computers in Accounting and Auditing 4 QH

Examines the use of computers in accounting and auditing. Covers systems design and applications in accounting, internal control of computer-based

systems, computer audit and control guidelines, and EDP audit tools and techniques. *Prereq.* ACC 1501 or ACC 1505.

ACC 1591 Independent Study 1 QH

This course is for the student who has received approval to undertake independent study in lieu of any course required in the various concentrations. Students present proposals to an Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study will take place. A copy of the final report prepared by the student will be presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from area coordinators.

ACC 1592 Independent Study 2 QH

Same as ACC 1591.

ACC 1593 Independent Study 3 QH

Same as ACC 1591.

ACC 1594, ACC 1595, ACC 1596, ACC 1597 Independent Study 4 QH

Same as ACC 1591.

ACC 1711 Honors: Accounting Principles 1 4 QH

See course description for ACC 1111.

ACC 1712 Honors: Accounting Principles 2 4 QH

See course description for ACC 1112.

ACC 1891 Honors Thesis in Progress 0 QH

ACC 1892 Honors Thesis 8 QH

ACC 1893 Honors Thesis in Progress 0 QH

ACC 1894 Honors Thesis 12 QH

Entrepreneurship

ENT 1330 Management of Smaller Enterprises 4 QH

Focuses on the strategies and operating problems of smaller, already established business enterprises. Designed for individuals who are considering entrepreneurial careers or careers in management, finance, or marketing within the smaller-company environment. Explores the characteristics and urgencies of problems that smaller companies are likely to encounter at different stages in their evolving life cycle, from the postnatal period to the more mature stage. *Prereq.* Middler standing.

ENT 1344 Opportunity Analysis and Venture Capital 4 QH

Focuses on the essential tasks performed prior to establishing a new venture, including finding a suitable business opportunity or developing an idea for a product or service; analyzing the feasi-

bility of the opportunity or idea; developing a business plan; structuring the venture team; seeking sources of seed capital; and forming a venture action plan for beginning operations.

ENT 1352 New Venture Creation: A Career Choice 4 QH

Assists students interested in small business in answering a number of important questions through a systematic analysis of their own potentials for entrepreneurial careers: What is involved in starting my own business? What is my own entrepreneurial orientation and commitment? What managerial and behavioral skills do I need for achievement? How can I plan for my personal and entrepreneurial goals? Presents case discussions, self-assessment, goal-setting exercises, guest speakers, and a student-selected project are used. *Prereq.* Senior standing.

ENT 1358 Small Business Institute Project 8 QH

The Small Business Institute Project was brought into existence with the cooperation of the Small Business Administration (SBA) and some of its client companies in Greater Boston. A student team is expected to interact with a company, helping management to analyze opportunities and problems facing the business, and to develop practical recommendations for the company's decision makers. Students are expected to allocate approximately one day per week to the project, including on-site work with the company owner-managers with whom they have been paired and to participate in related research, report preparation, and presentation of results. This real-world experience is blended with occasional class meetings and frequent team meetings with a faculty member to discuss the field work and to explore alternatives. Interim progress reports and a final report are presented to the client company, SBA, and the class. *Prereq.* Junior standing; one entrepreneurship course or permission of instructor.

ENT 1591 Independent Study 1 QH

This course is for the student who has received approval to undertake independent study in lieu of any course required in the various concentrations. Students present proposals to an Independent

Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study will take place. A copy of the final report prepared by the student will be presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from area coordinators.

ENT 1592 Independent Study 2 QH
Same as ENT 1591.**ENT 1593 Independent Study 3 QH**
Same as ENT 1591.**ENT 1594, ENT 1595, ENT 1596, ENT 1597 Independent Study 4 QH**
Same as ENT 1591.**ENT 1598 Independent Study 8 QH**
Same as ENT 1591.**ENT 1891 Honors Thesis in Progress 0 QH****ENT 1892 Honors Thesis 8 QH****ENT 1893 Honors Thesis in Progress 0 QH****ENT 1894 Honors Thesis 12 QH**

Finance and Insurance

FIN 1201 Personal Finance 4 QH

Focuses on management of the total personal estate: budgeting, savings, insurance, investments, borrowing, taxes, Social Security, pensions, annuities, securities markets, mutual funds, and their integration. *Not open to College of Business Administration students.*

FIN 1333 Financial Institutions and Markets 4 QH

Explores the financial environment faced by a firm as well as the financial institutions serving the economy. Discusses the forces that determine the changes in money and capital markets and explores the implications of changing financial environment for the management of funds in a firm and/or financial institution. *Prereq.* ACC 1112 and middler standing.

FIN 1335 Managerial Finance 4 QH

The objective of the course is to provide students the opportunity to gain knowledge of the advanced tools and concepts used in the management of funds. Topics include inventory and credit policies, risk, capital budgeting, financial structure, cost of capital, dividend policy, and valuation of a firm. Overall financial strategy and timing of its implementation are also examined. Specialized topics—mergers and acquisitions, financial

failure, and financial policy for multinational firms—may be considered in the course. *Prereq.* FIN 1438 and middler standing.

FIN 1346 Investment Management 4 QH

Presents a broad overview of the concepts, practices, and procedures of investment management. Covers basic security types, security market operations, security analysis (both fundamental and technical), and an introduction to portfolio management. *Prereq.* FIN 1438 and FIN 1333.

FIN 1438 Introduction to Finance 4 QH

Covers the concepts, practices, and procedures of financial management. Explores topics in valuation; risk management; capital budgeting; cost of capital; financial statement analysis; and financial forecasting, planning, and budgeting. Includes lectures, case discussion, and spreadsheet analysis. *Prereq.* ACC 1111 and MSC 1200.

FIN 1503 Taxes and Financial Decisions 4 QH

In this course, the case method is used to discuss a number of financial decisions that are greatly influenced by tax considerations, the most important of which are concerned with capital structure, dividend policy, acquisition terms,

investment policies and liquidations. The federal income tax receives primary consideration, but state and foreign taxes are also discussed. *Prereq.* FIN 1438 and middler standing.

FIN 1520 Options and Futures Markets 4 QH

Explores the relatively new concepts of financial futures, options on financial futures, and listed options markets as developed to help corporations and financial institutions manage interest-rate risk. Topics include mechanics of these markets, techniques that can hedge interest rate exposure, tracing methods, and current developments in the field. *Prereq.* FIN 1346.

FIN 1526 Securities Markets 4 QH

Analyzes the operation of the securities market. Provides students the opportunity to examine in detail the operation and function of investment bankers, broker-dealers, and securities exchanges. Thorough studies the mechanics of cash and margin accounts, trading options, and regulations affecting securities markets. *Prereq.* FIN 1438 and middler standing.

FIN 1530 Working Capital Management 4 QH

Examines strategies and analytical approaches to managing current assets and current liabilities. Explores corporate cash management under changing money market conditions. Discusses the use of interest rate futures and working capital management in a multinational context. *Prereq.* FIN 1438.

FIN 1531 Capital Investment Decision Analysis 4 QH

Analyzes capital budgeting techniques and portfolio considerations, including risk analysis, capital structure and valuation, and other long-term corporate finance topics. *Prereq.* FIN 1438.

FIN 1538 Financial Ethics 4 QH

Investigates and helps develop a systematic understanding of ethical dilemmas of financial business decision making. Examines the influence of business cultures on personal behavior, combining wisdom of the past with current ethical thinking and each individual's standards. *Prereq.* FIN 1438.

FIN 1540 Management of Financial Institutions 4 QH

Studies the decision-making problems faced by financial institutions such as commercial banks, savings and investment institutions, and finance companies when viewed as competitive, profit-seeking business entities. Covers such topics as the nature and scope of the capital markets confronting institutions, specialized problems regarding the sources and uses of funds of financial institutions, the nature of competition, the regulation of financial institutions, and strategic policy planning of financial institutions. *Prereq.* FIN 1438 or FIN 1333.

FIN 1543 Modern Portfolio Management 4 QH

Analyzes the methods of selection, revision, and performance measurement of asset portfolios.

Exposes the students to the current methods of building an asset portfolio. Presents and evaluates the concept of the efficient frontier of assets in the risk-return space. Includes a simulated equity fund-management project, in which students select equity securities and then prepare and present annual reports evaluating their portfolios' construction and performance. *Prereq.* FIN 1346.

FIN 1544 Bank Management 4 QH

Examines the financial management of commercial banks and thrift institutions. Analyzes the problems of liquidity and investment management, loan portfolio and capital management, and pricing problems associated with various sources and uses of funds in the context of changing economic and regulatory environment for these institutions. Presents lectures, discussions, and cases. *Prereq.* FIN 1438 or FIN 1333.

FIN 1545 Investment Banking 4 QH

Focuses on the managerial functions of investment banking firms. Examines individual investors and institutions in the money and capital markets from the viewpoint of investment banking firms. Familiarizes students with the operating and cash flow characteristics of institutional and individual clients. *Prereq.* FIN 1438.

FIN 1549 Principles of Real Estate 4 QH

Surveys the field of real estate, including principles of real estate law, valuation, brokerage, finance, land use, and negotiations. Gives the student the opportunity to become a better decision maker and to prepare for future studies in real estate. *Prereq.* FIN 1438.

FIN 1550 Real Estate Finance: Analysis and Investment 4 QH

Presents real estate financing techniques, sources of funds, and investment property analyses. Examines the legal and financial aspects of such techniques as mortgage liens, leaseholds, contracts for deed, and sale-leasebacks, as well as the primary and secondary mortgage markets. Surveys methods of valuing income properties. *Prereq.* FIN 1549.

FIN 1562 Employee Benefits Management 4 QH

Covers the design, implementation, and financing of corporate employee benefit plans. Presents a comprehensive analysis of qualified and non-qualified benefit and executive compensation plans. Emphasizes the proper management, design, and financing of these plans to achieve corporate goals at minimum feasible cost. Studies alternative methods of financing benefit and executive compensation plans. Includes recent developments in Social Security, benefits, and tax legislation. *Prereq.* FIN 1438 and middler standing.

FIN 1566 Risk Management and Insurance 4 QH

Emphasizes the functional area of corporate risk management. Covers such areas as organizing

and controlling the risk management function; identifying, measuring, controlling, and financing risk; selecting the best method of risk treatment; and implementing and monitoring risk management. Topics of exposure analysis include property, liability (public, employer, products, officers and directors, and professionals), income, and extraordinary expense losses. Covers treatment methods such as self-insurance, off-shore captive, retention groups, and commercial insurance. Includes recent developments such as tort reform integration of risk management with modern financial theory, as well as implications and analysis of recent tax reforms. *Prereq. FIN 1438 and middler standing.*

FIN 1580 Personal Financial Management 4 QH

Emphasizes the development of personal financial management expertise, based on an integrated plan for personal choices in which alternative courses of action are judged by their contribution to the attainment of the decision maker's particular set of economic objectives. Focuses on an overall personal economic plan and unites such diverse topics as inflation and investment selection, insurance, short- and long-run hedges against the purchasing power risk, and purchasing assets. Encourages decision making through exposure to alternative courses of action and leading toward a rational solution through development of techniques of estimating the success probabilities of alternative methods. *Prereq. FIN 1438 and middler standing.*

FIN 1582 Personal Insurance Planning 4 QH

Insurance planning is an important part of financial planning. In this course, focus is on the informed decisions necessary to establish a comprehensive, rational plan of personal insurance. Class discussion, lectures, and readings examine the various kinds of personal insurance and how to create an insurance package for clients with different insurance needs. *Prereq. FIN 1438.*

FIN 1591 Independent Study 1 QH

This course is for the student who has received approval to undertake independent study in lieu of any course required in the various concentrations. Students present proposals to an Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study will take place. A copy of the final report prepared by the student will be presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from area coordinators.

FIN 1592 Independent Study 2 QH
Same as FIN 1591.

FIN 1593 Independent Study 3 QH
Same as FIN 1591.

FIN 1594, FIN 1595, FIN 1596, FIN 1597 Independent Study 4 QH
Same as FIN 1591.

FIN 1738 Introduction to Finance (Honors) 4 QH

Acquaints students with basic processes, principles, tools, and concepts of finance. Topics include financial analysis, financial forecasting, profit planning, budgeting, working capital management, and capital budgeting. Covers the basics of financial markets, institutions, and sources of supply of different types of funds available to a firm. *Prereq. ACC 1112, MSC 1201, and middler standing.*

FIN 1759 International Financial Markets 4 QH

Introduces international financial markets, including balance of payments, history of the international monetary system, exchange-rate determination, foreign-exchange-exposure hedging strategies, and international capital markets. Emphasizes how international financial markets work and how corporations must adapt their decision-making to the international environment. *Prereq. FIN 1438.*

FIN 1760 International Financial Management 4 QH

Examines how the financial strategies and policies of multinational corporations differ from domestic corporations and how financial management is utilized in an international setting to achieve corporate goals. Specific topics include cost of capital, capital budgeting, capitalization policies, and management techniques for dealing with exchange-rate exposure and working-capital issues. Knowledge of exchange rates is assumed. *Prereq. FIN 1759.*

FIN 1770 Small-Business Finance 4 QH

Uses basic processes, principles, tools, and concepts of finance within the parameters of a small business to develop a complete financial plan that projects the future circular flow of funds by analyzing and then integrating the impact of both investment decisions (use of funds) and financial decisions (source of funds). *Prereq. FIN 1438.*

FIN 1804 Issues in Corporate Control (Honors) 4 QH

Examines the nature of conflicts between managers and shareholders over control of a corporation. Explores the effects of corporate control on financial performance of a firm and on decisions within the firm. Covers topics such as "managerialism," agency theory, problems in defining control of a corporation, and stock-price theory. Analyzes issues of dissident shareholder actions, such as proxy fights and hostile takeover attempts. *Prereq. Honors participation or permission of instructor.*

FIN 1806 Investment Arbitrage (Honors) 4 QH

Provides an opportunity to develop the prerequisite skills necessary for conducting successful investment arbitrage. Incorporating the recent insights into arbitrage pricing theory, students conduct an extensive computerized analysis of the arbitrage opportunities in the financial equity, debt, option, and futures markets. Examines this emerging and popular investment approach augmented with the appearances of guest arbitrage practitioners. *Prereq.* Honors participation or permission of instructor.

FIN 1808 The Chief Financial Officer (Honors) 4 QH

Develops, primarily through student interaction with financial executives, an understanding of the changing role of the CFO and to address significant topics in financial management. Topics include financial ethics, hostile takeovers, financial public relations, legal aspects of financial management, financial strategies at high-technology and public utility companies. Students develop research papers based on readings, case studies, and discussions with CFOs who participate in class sessions. *Prereq.* Honors participation or permission of instructor; junior standing.

FIN 1809 Restructuring the Modern Corporation (Honors) 4 QH

Investigates motivations, objectives, and results of different types of corporate restructurings. Covers

stock buybacks, leverage buyouts (LBOs), spinoffs, mergers, and capital structure changes (recapitalizations). Focuses on development of a historical perspective in regard to restructuring; a theoretical background, concentrating on stock price theory, dividends, mergers, and hostile takeovers; and a working knowledge of techniques and financial statement consequences of restructuring. Utilizes case discussions. Knowledge of spreadsheet software mandatory. *Prereq.* Honors participation or permission of instructor.

FIN 1810 Contemporary Issues in Corporate Finance (Honors) 4 QH

Examines recent developments in financial markets and the corporate environment. Issues include security offerings, signaling, and the implications for financial structure; option pricing and financial policy; and the disciplining effects of the market for corporate control and the wealth consequences to participating parties. *Prereq.* Honors participation or permission of instructor.

FIN 1891 Honors Thesis in Progress 0 QH

FIN 1892 Honors Thesis 8 QH

FIN 1893 Honors Thesis in Progress 0 QH

FIN 1894 Honors Thesis 12 QH

Human Resources Management

HRM 1332 Introduction to Human Resources Management 4 QH

Helps students develop understanding of contemporary issues in human resource management. Examines problems posed by changing work patterns, labor force characteristics, union activities, and government policies. Discusses and evaluates organizational experiments such as worker participation, job enlargement, and group incentives from a managerial perspective. *Prereq.* HRM 1432 or HRM 1433; middler standing.

HRM 1345 Contemporary Labor Issues 4 QH

Studies current issues dealing with labor in its broadest sense. Discusses and evaluates labor unions and manpower institutions as well as the emerging development and training problems motivated by unemployment, poverty, and changing work patterns. Reviews recent legislation dealing with the employment relationship. *Prereq.* HRM 1431 or HRM 1433.

HRM 1348 Reward Systems: Wage, Salary, and Benefits Administration 4 QH

Examines one of the major functions of personnel administration—compensation management—and its part in the overall personnel programs of

the organization. Develops through simulation exercises, group projects, lectures, and cases an analysis of reward systems as supportive mechanisms of management and the formulation of compensation policy and implementation of compensation systems. *Prereq.* HRM 1431 or HRM 1433.

HRM 1349 Selection and Assessment of Employees 4 QH

Examines three influences of employee selection and testing: the legal aspect of selection, where the greatest uncertainty is found; the influence of industrial psychology on selection and decision-making techniques; and the area of personnel practices itself, that is, the methods employers find effective in coping with legal requirements. Covers basic issues and procedures such as EEO, decision strategies, and the utility and evaluation of selection and appraisal systems. *Prereq.* HRM 1432 or HRM 1433.

HRM 1431 Complex Organizations 4 QH

Examines the structure and dynamics of the complex organization. Focuses on the design of the organization and its basic subsystems (reward, control, selection, development). Explores how organizational structures help shape human

behavior. Emphasizes understanding the interrelations among organizational structures, tasks, and individual characteristics within the context of a changing environment. *Prereq.* *Middler standing.*

HRM 1432 Organizational Behavior 4 QH

Explores the effects of individual, interpersonal, group, and leadership factors on human behavior. Also explores managerial applications of behavioral and social science concepts, including job design, job satisfaction, performance appraisal, supervision, career dynamics, and organizational change. Emphasizes helping the student develop skills in dealing with the human side of enterprise. *Prereq.* *Middler standing.*

HRM 1433 Organizational Behavior and Design 8 QH

Covers the material from HRM 1431 and HRM 1432. The structure and dynamics of the complex organization are examined, focusing on the design of the organization and its basic subsystems. The effects of individual, interpersonal, group, and leadership factors on human behavior are also examined. Students have the opportunity to explore how organizational structures help shape human behavior and to develop skills in dealing with the human side of enterprise. *Prereq.* *Middler standing.*

HRM 1508 Participative Management 4 QH

Participative management refers to a range of techniques that may enhance employee involvement in decision making. These methods take a variety of forms and are used in many different settings with mixed results. This course studies the motivational basis for participative programs, describes the forms and techniques available, and examines criteria for evaluating effectiveness. This course also considers internal and external organizational factors that may affect overall success of participation and discusses cultural and social aspects of participative management in an international business environment. *Prereq.* *HRM 1431 and HRM 1432 or HRM 1433.*

HRM 1519 Leadership 4 QH

In this course, the leadership function in a variety of organizational settings is studied. Using a contingency approach, students explore a range of possible leadership behaviors, relating the appropriateness of a particular style to a number of situational factors. Readings provide an opportunity to explore several contingency theories of leadership; cases allow for the application of these models; and videotaped role playing and self-assessment techniques permit students to evaluate their own leadership style. *Prereq.* *HRM 1431 or HRM 1433.*

HRM 1539 Managing Careers 4 QH

Surveys the tools for both self-assessment (investigating one's skills, abilities, needs, values, and interests) and career exploration (determining the nature of and requirements for entering

and succeeding in various career fields). Helps students develop an individualized plan of action that summarizes a wide variety of data indicating an individual's present status and career goals and the means by which to bridge the gap. *Prereq.* *HRM 1431 or HRM 1433.*

HRM 1581 Managerial Skills Seminar 4 QH

Studies and develops specific behavioral and interpersonal skills critical for managerial success, particularly those most vital early in management careers, in a seminar/workshop format. Uses introspective and experiential exercises and role plays extensively and discusses specific work assignments. *Prereq.* *HRM 1432 or HRM 1433 and satisfaction of middler-year writing requirement.*

HRM 1585 Managing Human Resources: The Legal Environment 4 QH

Studies the recent legal developments affecting the management of human resources. Examines recent state and federal laws that will influence managerial policies and practices in areas such as employment testing, hiring and promotion, controlling unemployment compensation and Worker's Compensation claims, and responding to OSHA and ERISA regulations. *Prereq.* *Middler standing.*

HRM 1591 Independent Study 1 QH

This course is for the student who has received approval to undertake independent study in lieu of any course required in the various concentrations. Students present proposals to an Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study will take place. A copy of the final report prepared by the student will be presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from area coordinators.

HRM 1592 Independent Study 2 QH
Same as HRM 1591.

HRM 1593 Independent Study 3 QH
Same as HRM 1591.

HRM 1594, HRM 1595, HRM 1596, HRM 1597 4 QH
Independent Study
Same as HRM 1591.

HRM 1760 International Labor Relations Systems 4 QH

Analyzes labor relations systems of selected countries in comparison with that of the United States. Also studies the political, cultural, and economic forces that shaped these systems. Gives special attention to such international institutions as multinational companies and the EEC. Cases, readings, and projects assigned. *Prereq.* *HRM 1431 or HRM 1433.*

HRM 1762 Managing People in International Settings	4 QH	HRM 1891 Honors Thesis in Progress	0 QH
Covers basic issues in human resources management relevant to managing in international and cross-cultural environments. Examines selection and training of personnel for work in multicultural environments, managing the international employee in the United States and abroad, cross-cultural communication, international environments, special issues of concern to small business, and change in multinational companies. <i>Prereq. Junior standing.</i>		HRM 1892 Honors Thesis	8 QH
		HRM 1893 Honors Thesis in Progress	0 QH
		HRM 1894 Honors Thesis	12 QH

International Business Administration

INB 1338 Introduction to International Business	4 QH	that operate abroad. Also considers what happens to other nation's firms operating in the United States and in third-country environments. Analyzes how "corporate culture" evolves in the context of national culture and the impact on managers. <i>Prereq. Middler standing.</i>	
Focus is on the cultural, economic, and political aspects of domestic and foreign environments and their effect on the international operations of business firms. Topics include the principles, patterns, and potential of international trade and investments; the development of management strategies for international businesses; and the organization and management of the firm's international operations. <i>Prereq. Middler standing.</i>		INB 1735 Import and Export Management	4 QH
INB 1352 Seminar in International Business	4 QH	Covers the principles and practices of international trade through import and export. Focuses on management aspects and explores details required to engage all aspects of international trade. Topics include government regulations, transportation, insurance, marketing, and finance.	
Applies the concepts and skills acquired in other international and domestic courses. Focuses on solving managerial problems in international and multicultural contexts. Uses case analysis to focus on business strategy and policy related to international operations. Requires significant class participation, written analysis, and understanding of current issues. <i>Prereq. INB 1338 and senior standing.</i>		INB 1802 Regional Topics in International Management (Honors)	4 QH
INB 1731 Cultural Aspects of International Business	4 QH	Focuses in depth on management in three very different, rapidly changing managerial environments: Europe in 1992, the less developed countries of Asia and Africa, and Eastern Europe. Uses case analysis, audio-visual material, and guest speakers to explore issues that managers face and especially how they operate in an environment of uncertainty and turbulence. <i>Prereq. Honors participation or permission of instructor.</i>	
Covers, from a managerial perspective, issues that arise when a firm moves from its home country to a host country that may have a different national culture. Focuses on United States-based firms			

Management

MGT 1115 Introduction to Business	4 QH	MGT 1446 Managing Social Issues	4 QH
Introduces the basic functions of management, team-taught by faculty from all areas of the College of Business Administration. Examines academic choices and career opportunities in business.		Analyzes environmental influences—economic, legal, technical, social, cultural, and ethical—affecting the corporation. Focuses on managerial decision making that will make the most effective use of the opportunities created by these external factors. <i>Prereq. HRM 1431 or HRM 1433; junior standing.</i>	
MGT 1345 Legal Aspects of Business	4 QH	MGT 1450 Business Policy	4 QH
Examines the legal aspects of business transactions and business relationships involving contracts and sale of goods under the Uniform Commercial Code, as well as product liability and agency law.		Focuses on corporate strategy and its elements, including an analysis of the company, its resources, opportunities, environment, and decision	

makers. Emphasizes decision making and implementation of strategy while operating a company in the context of a business simulation. *Prereq. Senior standing.*

MGT 1572 Law of Wills, Trusts, and Estates 4 QH

Examines requirements of valid will, claims of and against estates; the administration of estates, both formal and informal; essential elements for the creation of a trust; kinds of trusts, including inter vivos and testamentary trusts; the rights, responsibilities, and liabilities of trustees; and the rights of beneficiaries. *Prereq. Middler standing.*

MGT 1573 Bulk Sales and Bankruptcy 4 QH

Examines bulk transfers, with detailed study of the Uniform Commercial Code, Article 6; the need of the transferor to give to the transferee a sworn list of all his creditors; the giving of notice to the listed creditors; the contents of the notice, what creditors are protected; and the legal consequences of failure to comply with the Code. Also deals with both voluntary and involuntary bankrupts; the appointment and duties of the trustee; provable and dischargeable debts; priority of debts; discharge and acts that bar a discharge. *Prereq. Middler standing.*

MGT 1574 Law in Society 4 QH

Provides students the opportunity to acquire a broad view of their legal rights, obligations, and responsibilities in their relations with others and with the state. Includes study of torts, such as assault and battery, trespass, negligence, slander, libel, and deceit, and crimes such as homicide, assault and battery, robbery, arson, larceny, and burglary. *Prereq. Middler standing.*

MGT 1575 Negotiations 4 QH

Focuses on broadening the students' understanding of the negotiations process, emphasizing the strategies and techniques that might be employed in that process. Includes familiarization with related literature, student role playing, and interaction with professionals involved in private- and public-sector negotiations.

MGT 1591 Independent Study 1 QH

This course is for a student who has received approval to undertake independent study in lieu of any course required in the various concentrations. Students present proposals to an Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study will take place. A copy of the final report prepared by the student will be presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from area coordinators.

MGT 1592 Independent Study 2 QH

Same as MGT 1591.

MGT 1593 Independent Study 3 QH

Same as MGT 1591.

MGT 1594, MGT 1595, MGT 1596, MGT 1597 Independent Study 4 QH

Same as MGT 1591.

MGT 1720 Labor Law 4 QH

Helps acquaint the student with the many constitutional and legal problems involved in labor organizing, industrial relations, labor negotiations, labor contract enforcement, and dispute resolution. Examines cases for the legal principles underlying the common law, state and federal laws, and the constitutional questions of power and authority. Also considers the Sherman Act, Clayton Act, Norris-LaGuardia Act, and Labor Management Relations Act. *Prereq. Middler standing.*

MGT 1808 Honors: Seminar on the Management of Innovation 4 QH

The management of technological innovation is of critical importance to American companies as they face increasing worldwide competition. Knowledge in the area is advancing rapidly and incorporates work from several disciplines, including strategy, marketing, organizational behavior, and finance. This course will be run as a research seminar. Students will be responsible for identifying relevant topics in the management of innovation and completing a research study. Students can work either individually or in small groups on the research topic they define. Students will be required to submit a research proposal, a progress report at mid-quarter, and a final paper and presentation. *Prereq. Honors participation or permission of instructor.*

MGT 1819 Honors: Seminar in Research 4 QH

Focuses on the definition of research in the context of the business environment, research methodologies, and the student's attempt at research through a term project. Analyzes the formulation of concepts, hypotheses, and theories; the design of research projects; data collection; data analysis; and report writing. Involves a term project that investigates a subject of interest to the student and that is intended to serve as a prototype of honors thesis. *Prereq. MSC 1201.*

MGT 1820 Honors: Independent Study 4 QH

Offers directed study toward fulfillment of Honors Program requirements and is open only to students who have been accepted into the Honors Program. Procedures for arranging the honors independent study are the same as those for MGT 1594.

MGT 1828 Honors: Legal Environment of Business 4 QH

Examines significant legal issues confronting the corporate community through cases, readings, and videotapes. Topics include discrimination in employment, protection of workers, product and service liability, antitrust law, and the law of business organizations. Provides practical legal advice for potential managers. *Prereq. Honors participation or permission of instructor.*

MGT 1891 Honors Thesis in Progress	0 QH	MGT 1893 Honors Thesis in Progress	0 QH
MGT 1892 Honors Thesis	8 QH	MGT 1894 Honors Thesis	12 QH

Marketing

MKT 1331 Marketing Management 4 QH
Provides training in marketing decision making. Uses case studies simulating actual business settings to help students develop analytical abilities and sharpen their communications skills. Covers topics that range from techniques used to analyze a market to the development of a total marketing strategy (product policy, pricing policy, promotion policy, and distribution policy). *Prereq. MKT 1435 and middler standing.*

MKT 1341 Marketing Research 4 QH
Focuses on the survey research process and the analysis of data using “canned” computer programming routines. Covers topics such as problem definition, research design, sampling techniques, questionnaire development, data collection methods, and data analysis. Students expected to work on group projects with participating firms. Requires no previous computer experience. *Prereq. MKT 1331 and MSC 1201.*

MKT 1351 Competitive Strategy 4 QH
This course is a capstone marketing course, required of all students with a marketing concentration. The focus is on the formulation of marketing strategy at a policy level and its implementation in a dynamic environment. *Prereq. MKT 1331, MKT 1341, and senior standing.*

MKT 1435 Introduction to Marketing 4 QH
Consists of lectures, readings, and small-group discussions on the role of marketing in contemporary society, in the business enterprises, and in the nonprofit organization. Considers the planning, operation, and evaluation of marketing and promotional efforts necessary to the effective marketing of consumer and industrial products and services in both profit and nonprofit organizations. *Prereq. Middler standing.*

MKT 1501 Introduction to Retailing 4 QH
Explores the range of retail firms that make up the retailing industry, from large mass merchandisers to small specialty outlets. Examines the functions, practices, and organizations of various store types. Considers such topics as current issues, career opportunities, the environment of retailing and retailing’s role in the economy. *Prereq. Middler standing.*

MKT 1503 Retail Merchandising and Control 4 QH
Examines the concepts and techniques of store operations and merchandise management. Considers topics such as calculating and planning markups and markdowns, pricing, inventory control, stock turn, open-to-buy, profitability

analysis, and expense control. *Prereq. MKT 1435 or permission of instructor.*

MKT 1504 Fashion Retailing 4 QH
Provides an understanding and appreciation of the dynamics and multidimensional nature of the fashion business. Uses assigned readings and projects to examine how the fashion industry functions and how fashion is produced and merchandised. Simulates functions of the retail buyer. *Prereq. MKT 1435 or permission of instructor.*

MKT 1507 Retail Strategies and Problems 4 QH
Considers strategic and policy decisions of major retail enterprises engaged in food, apparel, and general merchandise distribution. Analyzes the evolution of retail institutions along with the characteristics of and prospects for new store types. *Prereq. MKT 1435; junior or senior standing or permission of instructor.*

MKT 1512 Marketing for Nonprofit Organizations 4 QH
Examines the unique characteristics of marketing in public and nonprofit enterprises. Aims to expand the scope of marketing management concepts beyond the traditional setting of business. Pays particular attention to the basic decision-making differences between public and private firms. Involves case analysis, assigned readings, and a group project. *Prereq. MKT 1331 and middler standing.*

MKT 1515 Marketing in the Service Sector 4 QH
Presents a basic treatment of methods and techniques for marketing in the service sector, which includes sports, recreation, public service, banking, insurance, and hotels. Also analyzes a number of descriptive studies covering the application of such marketing principles in key service areas. *Prereq. MKT 1331 and middler standing.*

MKT 1523 Advertising Management 4 QH
Focuses on the management of the advertising function in relation to a firm’s overall marketing objectives. Approaches the subject from the perspective of the user of advertising (for example, the product manager and the marketing manager). Uses case studies and text material to help the student develop decision-making skills. *Prereq. MKT 1331 and middler standing.*

MKT 1531 Sales Management 4 QH
Helps the student develop decision-making skills necessary for both building and maintaining an effective sales organization. Uses cases and readings to examine the strategic and operating problems of the sales manager. Includes such major

topic areas as the selling function, sales management at the field level, and the sales executive.

Prereq. MKT 1331 and middler standing.

MKT 1536 Brand Management 4 QH

Focuses on the management and development of brand strategies as well as the management of the product mix in the multi-product firm. Includes such topics as evaluating and planning new consumer product introductions, identifying and screening new product opportunities, evaluating market performance, segmenting the product/market, and managing the product line. *Prereq. MKT 1331 and middler standing.*

MKT 1540 Marketing Channels 4 QH

Studies marketing structures and institutions: their evolution, functions, interrelations, and the management of their role in the marketing process. *Prereq. MKT 1435 or permission of instructor; junior or senior standing.*

MKT 1542 Industrial Marketing 4 QH

Examines the marketing of products where business firms are the potential customers. Upperclass elective, open to juniors and seniors. *Prereq. MKT 1331 and middler standing.*

MKT 1545 New Product Development 4 QH

For most firms, coping with the problems of environmental change through modification of the product line is both vital and difficult. This seminar is concerned primarily with the examination and analysis of the problems firms face in directing and managing their new product development activities. *Prereq. MGT 1450.*

MKT 1553 Foundations of Consumer Behavior 4 QH

Helps students develop an understanding of consumer attitudes and behavior processes as the basis of the design of marketing problems. Considers economic and behavioral models of consumer behavior and underlying behavioral theories and concepts. *Prereq. MKT 1331 and middler standing.*

MKT 1580 Quantitative Methods in Marketing 4 QH

Focuses on statistical methods and techniques commonly used in the analysis and interpretation of survey and experimental data. Uses "canned" computer programs to illustrate the applicability of the methods discussed. Requires no previous computer experience. *Prereq. MSC 1201.*

MKT 1591 Independent Study 1 QH

This course is for the student who has received approval to undertake independent study in lieu of any course required in the various concentrations. Students present proposals to an Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study will take place. A copy of the final report prepared by the student will be presented to the

appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from area coordinators.

MKT 1592 Independent Study 2 QH

Same as MKT 1591.

MKT 1593 Independent Study 3 QH

Same as MKT 1591.

MKT 1594, MKT 1595, MKT 1596, MKT 1597 Independent Study 4 QH

Same as HRM 1591.

MKT 1735 Honors: Introduction to Marketing 4 QH

Explores the role of marketing in contemporary society, business enterprises, and nonprofit organizations through lectures, readings, and small group discussions. Considers planning, operating, and evaluating marketing and promotional efforts that are necessary to effectively market consumer and industrial products and services in both profit and nonprofit organizations. *Prereq. Middler standing and honors participation.*

MKT 1760 International Marketing 4 QH

Introduces those aspects of marketing that are unique to international business within the framework of traditional functional areas of marketing. Focuses on the environment and the modifications of marketing concepts and practices necessitated by environmental differences. Includes such topics as cultural dynamics in international markets, political and legal environmental constraints, educational and economic constraints, international marketing research, international marketing institutions, and marketing practices abroad. *Prereq. MKT 1331 and middler standing.*

MKT 1807 Honors: Analysis of Survey Data 4 QH

Focuses on the most widely used techniques for analyzing survey data and discusses some of the problems researchers face in their attempts to obtain high-quality, reliable information. Opportunities to analyze data from previously collected surveys and to prepare summary reports that succinctly summarize the major findings.

MKT 1809 Honors: The Marketing and Sales Executive 4 QH

Introduces the skills required of a senior marketing and sales executive. Focuses on the importance of sales management in implementing overall marketing strategy. Emphasizes practical theories and approaches for improving the total effectiveness of the marketing/sales function. *Prereq. Honors participation or permission of instructor.*

MKT 1891 Honors Thesis in Progress 0 QH

MKT 1892 Honors Thesis 8 QH

MKT 1893 Honors Thesis in Progress 0 QH

MKT 1894 Honors Thesis 12 QH

Management Science

MSC 1200 Business Statistics 1

4 QH

Studies statistics, which is the methodology concerned with data collection, analysis, and interpretation. Discusses the information that is generated by statistical methods and used for analyzing decisions in the face of uncertainty. Introduces fundamental concepts and methodology of statistics, probability distribution, estimation, and hypothesis testing. *Prereq.* MTH 1114.

MSC 1201 Business Statistics 2

4 QH

Continues topics covered in MSC 1200. Includes chi-square tests, simple and multiple regression-correlation analysis, and elementary concepts of time series analysis. *Prereq.* MSC 1200.

MSC 1226 Computer-Based Information Systems

4 QH

Presents basic computer literacy skills for business. Covers topics such as computer hardware, operating systems, and telecommunications. Provides the opportunity to gain competency in widely used wordprocessing, spreadsheet, and database software packages through extensive hands-on exercises. Requires a project that allows students to integrate the skills gained in the course and apply them to the solution of a specific business problem. *Prereq.* Sophomore standing.

MSC 1331 End User Computing

4 QH

(Formerly MSC 1562) Continues MSC 1226. Explores more fully the MS-DOS environment, other operating systems, utility software, various hardware platforms, and critical aspects of networking. Introduces the fundamentals of a fourth-generation language and its use in developing a simple database application. Gives students the opportunity to investigate technical and managerial issues related to computer-based information systems through a project or research paper. *Prereq.* MSC 1226 and middler standing.

MSC 1339 Business Programming 1

4 QH

(Formerly MSC 1352) Examines the basics of structured programming using a modern block-structured language such as C. Focuses on concepts such as data-structures (for example, variables and records arrays), control-structures, variable scoping, parameter passing, and modular programming. *Prereq.* MSC 1226 and middler standing.

MSC 1340 Business Programming 2

4 QH

(Formerly MSC 1353) Continues MSC 1339. Focuses on concepts such as pointers, file-handling, object-oriented programming, and design and programming walkthroughs. *Prereq.* MSC 1331, MSC 1339, and junior standing.

MSC 1349 Systems Analysis and Design

4 QH

Covers concepts and techniques in systems analysis and design, including the systems develop-

ment life cycle, prototyping, systems design techniques, the role of the systems analyst, project management, and the efficient use of available resources and technology. *Prereq.* MSC 1339.

MSC 1350 Database Management Systems

4 QH

Discusses the use of database management systems (DBMS) for business data processing and MIS. Covers the principles of database design, using the hierarchical, network, and relational data models. Includes other topics such as normalization, the data dictionary, query languages, forms management software, fourth-generation software environments, and distributed DBMS concepts. Provides practical experience in using a DBMS implemented on the University's computers. Explores management issues in the implementation and control of DBMS. *Prereq.* MSC 1340 and MSC 1349.

MSC 1351 Management Information Systems and Computers

4 QH

(Formerly MSC 1571) Analyzes the dynamic nature of effective information systems in supporting decision making in organizations. Uses both text and cases to present a framework for developing, managing, and using the information resources of the organization. Topics include strategic planning for information systems, meeting the information needs of the various functional areas of management, office automation, the information center, decision support systems, distributed processing, security and privacy issues, artificial intelligence, expert systems, and organizational and political problems associated with managing information. *Prereq.* MSC 1350 and senior standing.

MSC 1433 Quantitative Models in Business

4 QH

Focuses on the construction of appropriate mathematical models (simplified representations or abstractions of reality) for managerial decision-making problems. Discusses criteria for selecting various stochastic and deterministic models. Specifically covers decision trees, decision analysis, linear programming, and simulation. *Prereq.* MSC 1201.

MSC 1441 Operations Management

4 QH

Considers the productive system of an enterprise whereby inputs of technology, materials, personnel, and information are transformed into useful goods and/or services. Introduces the types of problems and issues encountered by the operations manager. Discusses various models and techniques but emphasizes problem formulation and managerial implications. *Prereq.* MSC 1201.

MSC 1501 Purchasing and Materials Management

4 QH

Examines decisions related to the flow of materials from supplier to point of use. Emphasizes prob-

lems related to purchasing, including negotiation, value analysis, and supplier selection. Emphasizes materials management in manufacturing organizations, but also covers nonprofit and non-manufacturing concerns. Applies latest research in field gleaned from projects sponsored by the National Association of Purchasing Management and the American Production and Inventory Control Society. *Prereq.* MSC 1441.

MSC 1553 Decision Analysis 4 QH

Focuses on the analysis of decision making, with particular emphasis on realistic problems under uncertainty. Aims to help improve the student's ability to make better decisions through a careful consideration of alternative courses of action and their consequences, relevant objectives, and the element of risk. Covers the basic components of decision problems, the concepts of risk and utility, decision trees, and value of information and multicriteria decision-making. *Prereq.* MSC 1201.

MSC 1591 Independent Study 1 QH

This course is for the student who has received approval to undertake independent study in lieu of any course required in the various concentrations. Students present proposals to an Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study will take place. A copy of the final report prepared by the student will be presented to

the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from area coordinators.

MSC 1592 Independent Study 2 QH

Same as MSC 1591.

MSC 1593 Independent Study 3 QH

Same as MSC 1591.

MSC 1594, MSC 1595, MSC 1596, MSC 1597 Independent Study 4 QH

Same as HRM 1591.

MSC 1700 Honors: Business Statistics 1 4 QH

See course description for MSC 1200.

MSC 1701 Honors: Business Statistics 2 4 QH

See course description for MSC 1201.

MSC 1726 Honors: Introduction to Data Processing 4 QH

See course description for MSC 1226.

MSC 1826 Honors: Business Forecasting

Focuses on analyzing data using statistical models from various functional areas of business. Students prepare reports based on actual data that emphasize forecasting.

MSC 1891 Honors Thesis in Progress 0 QH

MSC 1892 Honors Thesis 8 QH

MSC 1893 Honors Thesis in Progress 0 QH

MSC 1894 Honors Thesis 12 QH

Transportation

TRN 1333 The Domestic Transportation System 4 QH

Examines the structure, operations, and problems of the several modes of transportation. Outlines the government role in regulation and promotion. Also highlights the interaction between carriers and shippers in the transportation marketplace. *Prereq.* ECN 1105 and middler standing.

TRN 1335 Current Issues in Logistics and Transportation 4 QH

Identifies important contemporary issues and problems in logistics and transportation and examines their nature and significance. Explores alternative approaches to these topics through analyzing in-depth various options and their implications.

TRN 1344 Business/Logistics 4 QH

Analyzes the role and activities of those involved in corporate transportation/logistics decision making. Emphasizes the importance of transportation planning, inventory control, warehousing, customer service standards, and location decisions in the design and operation of distribution systems. *Prereq.* Junior standing.

TRN 1353 Seminar in Transportation and Logistics 4 QH

Focuses on a limited number of advanced transportation/logistics topics. Offers students experience with business and government through individual research on topics selected for class presentation/discussion. *Prereq.* Senior standing.

TRN 1514 Carrier Management 4 QH

Examines the perspective of those involved in managing the several modes of transportation. Emphasizes the decision-making process related to such issues as carrier financing, pricing, labor relations, and equipment selection. *Prereq.* TRN 1333.

TRN 1528 Urban Transportation 4 QH

Focuses on the movement of people and freight in and around metropolitan areas. Examines the role of transit managers in planning, implementing, and operating mass transit systems. Also outlines how various governmental units participate in financing and regulating urban transportation. *Prereq.* Middler standing.

TRN 1591 Independent Study	1 QH	TRN 1721 Labor/Management Issues in Transportation	4 QH
This course is for the student who has received approval to undertake independent study in lieu of any course required in the various concentrations. Students present proposals to an Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study will take place. A copy of the final report prepared by the student will be presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from area coordinators.		Focuses on labor in the transportation industries. Examines trends in employee compensation, productivity, bargaining patterns, and influence of government policies on labor/management issues. <i>Prereq.</i> TRN 1333.	
TRN 1592 Independent Study	2 QH	TRN 1760 International Transportation and Logistics Management	4 QH
Same as TRN 1591.		Examines the current and future status of ocean and air transportation in international trade and development. Also analyzes the activities of those involved in logistics planning in multinational companies. <i>Prereq.</i> Middler standing.	
TRN 1593 Independent Study	3 QH	TRN 1891 Honors Thesis in Progress	0 QH
Same as TRN 1591.		TRN 1892 Honors Thesis	8 QH
TRN 1594, TRN 1595, TRN 1596, TRN 1597 Independent Study	4 QH	TRN 1893 Honors Thesis in Progress	0 QH
Same as HRM 1591.		TRN 1894 Honors Thesis	12 QH

Counseling Psychology, Rehabilitation, and Special Education

CRS 1030 Introduction to Emotional Disturbances in Children	4 QH	CRS 1302 Methods and Materials of Teaching in Special Education	4 QH
Reviews emotional processes that interfere with learning activities; studies approaches used to deal with behavioral disorders. Emphasizes classroom management techniques, use of consultation, and parent-teacher interaction.		Focuses on the following areas: development and implementation of individualized educational plans; task analysis; adaptation and selection of materials; strategies in applied classroom management techniques; and adaptation and selection of materials and strategies in language arts, mathematics, and perceptual-motor skills. <i>Prereq.</i> CRS 1200, CRS 1300, CRS 1301, or senior status.	
CRS 1200 Introduction to Special Education	4 QH	CRS 1304 Socio-Psycho Dynamics of Family Life	4 QH
Surveys the characteristics and the social, emotional, and educational adjustment of special-needs children and youth. Evaluates the effects of society's attitudes, the individual's own attitude toward the handicap, and the effect of the handicap itself. Reviews current legislation.		Introduces and surveys the internal and external dynamics of family life. Examines the significance of such dynamics to the mental health of the special needs child. Explores approaches to working with parents in home-school relationships, as well as the effects of disability on the family.	
CRS 1300 Introduction to Learning Disabilities	4 QH	CRS 1305 Psychology of the Mentally Retarded	4 QH
Surveys behavioral characteristics of children who present specific deficits in perceptual, integrative, or expressive processes that impair learning efficiency. Emphasizes student evaluation, development of curriculum materials, and adaptation of teaching methods.		Analyzes the etiology, nature, and needs of the retarded individual, emphasizing cognitive and psychosocial development. Explores the implications of these characteristics for life-span management in conjunction with parental and community attitudes and involvement.	
CRS 1301 Diagnostics in Special Education	4 QH	CRS 1306 Introduction to Rehabilitation	4 QH
Focuses on developing competence in the formal and informal assessment of children's learning needs. Also emphasizes observing, recording, and analyzing children's behavior and learning environments. <i>Prereq.</i> CRS 1200 and CRS 1300.		Surveys the field of rehabilitation, including its historical development, psychological implica-	

tions, and sociological dimensions. Pays special attention to rehabilitation of specific disability groups, such as the physically disabled, the emotionally disturbed, the mentally retarded, alcoholics, drug dependents, and public offenders.

CRS 1310 Intervention Strategies for the Human Services 4 QH

Introduces the wide range of skills used in working with clients in the various helping professions, for example, counseling (individual and group), advocacy, rehabilitation, community organizing, and income maintenance. Utilizes role playing, simulations, and interviews with practicing professionals. Also requires readings, but no fieldwork. Intended as preparation for more specialized courses; required for Human Services majors but open to other students with appropriate backgrounds.

CRS 1311 Case Management: Diagnosis and Treatment 4 QH

Introduces the basic theory and skills of managing client's treatment programs in a variety of institutional settings. Provides training in the identification of the components of a psychosocial assessment, examination of common techniques of planned service delivery and resource coordination, and review of the diverse entitlements available to clients of diverse needs and backgrounds. Utilizes a seminar-like format. *Prereq.* PSY 1111 or SOC 1100.

CRS 1312 Introduction to Family Systems Counseling 4 QH

Introduces the concepts and skills of family systems therapy, a counseling orientation in which the family is the chosen social unit of assessment and intervention for the client's problem. Covers major approaches within communications and structural frameworks, emphasizing implications for normal family development and interventions in dysfunctional systems. Addresses theory and strategies for working with marital and parenting subsystems. Offers students a beginning opportunity to experience how their family affects their professional functioning in various social systems. *Prereq.* CRS 1314.

CRS 1313 Introduction to Group Counseling 4 QH

Provides a foundational exposure to the theory and skills of group counseling as practiced in various human service settings. Covers developmental stages of counseling groups: approaches to leadership style, and strategies for starting, maintaining, and terminating the counseling group. Includes an opportunity for students to practice rudimentary skills of leadership of counseling groups and to become involved in focused group-process activities. *Prereq.* CRS 1314.

CRS 1314 Introduction to Counseling 4 QH

Surveys major theoretical approaches to counseling. Provides training and practice in listening skills to aid in the development of facilitative responses. Combines didactic presentations and experiential activities to assist students in understanding and implementing a variety of counseling approaches.

CRS 1317 Student Teaching and Seminar in Special Education 8 QH

Allows for full-time participation in a University-arranged and supervised school program. Gives the student the opportunity to analyze the teaching of and the learning by special-needs students and to demonstrate, evaluate, and develop teaching skills in a variety of classroom settings. *Prereq.* Formal acceptance into and completion of advanced professional sequence with minimum 2.0 Q.P.A. both overall and in teaching major.

CRS 1800 Directed Study 4 QH

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. Directed Study requires approval of the supervising faculty member and of the dean's office of the Boston-Bouvé College of Human Development Professions. Approval forms must be submitted to the dean's office during the quarter prior to registration for the directed study. *Prereq.* Permission of instructor.

Education

ED 1003 Reading/Study Skills 1 4 QH

Provides instruction to students who demonstrate a need to be more efficient in comprehending and studying college textbooks and collateral reading assignments. Concentrates on techniques involved in understanding informative materials and introduces the evaluation of persuasive prose. In addition, presents suggestions on such topics as how to listen to and take summary notes on course lectures and how to set study goals and priorities consistent with course objectives.

ED 1004 Reading/Study Skills 2 4 QH

Continues topics introduced in ED 1003 and expands upon the analysis and interpretation of persuasive texts. Emphasizes reading imaginative prose for meaning and pleasure, preparing for and taking examinations, and learning to adjust reading speed and method to various materials encountered in concurrent courses.

ED 1005 Practicum in Reading and Study Skills 4 QH

Gives students in the academic program Project Ujima comprehensive tools to help them to master

the how-to's of reading textbooks, notetaking, outlining, introductory research skills, time management, studying skills, and other techniques necessary for success in college.

ED 1100 Education and Social Science 4 QH

Draws on anthropology, psychology, and sociology, and some of the concepts, methods, and terminology of those fields. Concentrates on the evolution of human nature, the influence of previous experience and learning on the behavior of individuals and groups, the difficulties in achieving a full degree of humanity in a technological society, and the potentially powerful roles that "professional socializers" (teachers, clinicians, group leaders, and so forth) can play in the lives of students and clients.

ED 1101 Education for the Future: A Creative and Humanistic Approach 4 QH

Gives students the opportunity to gain a perspective on the array of conflicting learning experiences that bombard their lives; to identify the factors that influence what people learn and from whom; and to evaluate the potential effects of these learnings. Encourages students to develop frames of reference through which to examine their own roles in the education process. Utilizes a creative and humanistic approach to teaching.

ED 1102 Human Development and Learning 1 4 QH

Surveys developmental processes from the pre-natal period through preadolescence. Covers principles of physical, cognitive, language, social, and personality development and discusses the implications for childrearing and schooling.

ED 1103 Human Development and Learning 2 4 QH

Presents a basic overview of the continuity of human development in contemporary society, from the pre-adolescent period through adolescence, adulthood, middle age, and old age. Considers significant areas of growth, development, and adjustment for each period, including social, sexual, personality, motivational, and cognitive aspects.

ED 1104 Analysis of the Instructional Process 4 QH

Examines conflicting theories about the nature of teaching and learning. Evaluates the effects of traditional and innovative educational systems on learners. Identifies educational tools for describing, analyzing, and evaluating aspects of learning and teaching; refines students' use of those tools during sequential field observations and class meetings. Requires fieldwork.

ED 1105 Day Care and Nursery Schools: Social and Cultural Origins 4 QH

Explores the origins of the increased contemporary use of out-of-the-family child care arrangements in the United States and in selected European and third-world nations. Covers the interrelation of industrialization, technology, and family functioning; contrasting varieties of child care centers in

operation today; and effects of the proliferation of child care centers on other aspects of society, such as neighborhood life, business, parents' lifestyles, elementary school curricula, government spending, and the job market in education and human services. Requires three to four hours per week of fieldwork in child care. *Prereq. ED 1100 or equiv.*

ED 1106 Creative Expression in Children 4 QH

Assists students who are interested in working with children in a variety of settings. Focuses on the potential of creative expression in interpersonal communication and the relation of children's creative experiences to their cognitive, emotional, and social development. Provides the opportunity to acquire the hands-on experience and confidence to work with various media available for creative expression. *Prereq. ED 1102.*

ED 1300 Education and Psychosocial Development 4 QH

Examines theories and research on the socialization functions of education. Covers the relative influence of early versus postchildhood socialization and the role of diverse educational experiences and institutions in personality development. *Prereq. ED 1100 or equiv.*

ED 1302 The Human Services Professions 4 QH

Explores what a human service agency is, how it comes into being, how it grows and changes. Analyzes attitudes, values, skills, and knowledge of the human services worker and the reasons why people in modern society require human services assistance. Views human services from the eyes of clients as well as society as a whole. Requires fieldwork in a human service agency as well as a good deal of independent study. Required for all human services majors; open to other students on space-available basis. *Prereq. ED 1100, SOC 1100, or equiv.*

ED 1304 Language and Cognition: Educational Implications 4 QH

Focuses on the development of language and thought in the child. Includes such topics as concept attainment and problem solving and the relationship of language to cognitive functioning. Gives particular consideration to the educational implications of the material. *Prereq. ED 1102 or ED 1103.*

ED 1306 Measurement and Evaluation 4 QH

Emphasizes evaluation techniques for use in the classroom and teaching-learning situations at all levels. Explores the importance of establishing behavioral objectives as a basis for evaluation. Places considerable emphasis on improving teacher-made tests, especially objective-type tests. Requires students to construct an objective test in their discipline for an instructional unit. Also reviews other evaluation techniques besides tests. Gives brief attention to standardized measurement instruments of ability and achievement as they may be used in the evaluation of pupil progress.

ED 1307 Introduction to Educational Statistics 4 QH

Emphasizes descriptive statistics useful in the evaluation of educational and related professional activities. Covers statistical notation, variability, probability, sampling techniques, linear regression, correlation, t-tests, and chi-square tests of significance. Draws, as much as possible, examples of applications of these techniques from the fields for which students in the course are preparing.

ED 1310 Class and Ethnic Relations in Education 4 QH

Focuses on the various ways in which the American class system and patterns of ethnic group relations have affected, and have been affected by, American education. Analyzes the limitations and potential of educational institutions for resolving intergroup conflicts and establishing equal educational opportunities. *Prereq.* ED 1100 or equiv.

ED 1312 Comparative Education 4 QH

Compares the national school systems of selected foreign countries with the school system in the United States. Includes comparative data in the fields of teaching, speech and hearing, special education, and human services.

ED 1313 Current Issues in American Education 4 QH

Analyzes the current issues confronting teachers, speech and hearing clinicians, special education practitioners, and human services specialists. Attempts to place these issues in a historical context.

ED 1314 Philosophy of Education 4 QH

Helps participants to examine their own purposes in relation to those of the school as an institution. Studies philosophical writings on topics such as the ethics of educational intervention, the delineation of educational concepts, the educational messages of long-range speculations and utopias, and normative assumptions underlying educational policies.

ED 1317 Seminar in Group Process 4 QH

Studies the structure, dynamics, and function of face-to-face groups to learn about goal achievement and task orientation. Operates mainly by committee or group instrumentation. Focuses on gaining an understanding of the function of informal relationships within formal organizations, the various roles within groups, peer relationships, superior-subordinate relationships, authority and intimacy, and the inclusion and exclusion processes.

ED 1318 Seminar in Early Childhood Development 4 QH

Focuses on views of cognitive, personality, and social development during early childhood. Discusses the implications of these views. Requires each student to carry out a project in the field placement and report results to the seminar. *Prereq.* ED 1102.

ED 1400 Fundamentals of Reading 1 4 QH

Introduces developmental reading for prospective early childhood and elementary teachers. Emphasizes beginning reading as it relates to the clinical environment. Studies areas of skill development, in detail, as well as some methods and techniques of testing and grouping. Also introduces some reading books and materials, methods of teaching, and the psychology of learning to read.

ED 1402 Fundamentals of Reading 2 6 QH

Continues topics introduced in ED 1400. Focuses on study skills, and speed and fluency development. Extends the tutorial work and gives the student further opportunity to achieve familiarity with books, materials, and methods. *Prereq.* ED 1400.

ED 1403 Remedial Reading 4 QH

Familiarizes prospective teachers with some of the most commonly known reading problems in the typical classroom as well as in the Reading Clinic. Analyzes and evaluates the typical diagnoses of such problems and corrective programs. Studies tutorial work with a retarded reader, with each student keeping a log or journal of work with a particular reading problem. *Prereq.* ED 1402.

ED 1404 Linguistics and Reading 4 QH

Explores the nature of language and relevant English language systems to help students acquire a linguistic perspective on the reading process and reading instruction. Examines pedagogical implications in light of current knowledge about children's language acquisition and use. Evaluates early structural linguistic proposals for teaching reading and considers recent psycholinguistic models of the reading process. Discusses issues concerning the language-different child. *Prereq.* ED 1402.

ED 1405 Literature and Learning Materials for Children and Young Adults 4 QH

Offers a comprehensive survey of the field of children's literature and literature for young adults. Although designed specifically for prospective teachers (and required of all Early Childhood and Elementary Education majors), may also be taken as an elective by all students. Surveys and evaluates examples of contemporary children's literature and other learning materials used in preschool, elementary, secondary, and remedial programs. Covers such recurring themes as racism and sexism in children's books, controversial books for young children, contemporary illustrators, and banned books.

ED 1406 Elementary Education Curriculum 1 4 QH

Analyzes various patterns of organizing elementary school curriculum on the basis of the general objectives of the public school system in the United

States. Requires students to evaluate and organize units of work that can accommodate children at different developmental levels. Emphasizes the integrated approach to curriculum organization, with language arts, music, and arts as central focus. Requires fieldwork.

ED 1407 Elementary Education Curriculum 2 4 QH
Describes and evaluates social studies curricula in use in elementary school. Develops criteria to select appropriate social studies content, skills, and attitudinal objectives. Expects students to use these criteria to develop social studies experiences that meet the developmental needs of learners and to shed light on the lives of individuals and groups within different cultural settings. *Prereq. ED 1406.*

ED 1408 Elementary School Math 4 QH
Focuses on methods and materials of mathematics for Early Childhood and Elementary Education majors. Provides the opportunities for University students to explore various strategies and materials of teaching mathematics in a manner that takes into account the developmental stages of children. Requires fieldwork.

ED 1409 Elementary School Science 4 QH
Surveys methods and materials of science for Early Childhood and Elementary Education majors. Offers the student the opportunity to explore some limited but varied content areas in science and to consider how these areas can be taught to children.

ED 1410 Methods and Materials for Teaching Adolescents and Adults 1 4 QH
Considers specific methods and materials appropriate to teaching adolescents and adults. Seeks to develop in the students an understanding of the complexities of the materials and methodology of the teaching-learning process, to encourage within students attitudes conducive to and identified with good tenets of teaching, and to foster in the students acceptance of the need to grow constantly and to be aware of the continuing development of the learning-teaching process. Requires fieldwork. *Prereq. ED 1104.*

ED 1411 Methods and Materials for Teaching Adolescents and Adults 2 4 QH
Focuses on the various subject areas of teaching techniques of organizing and presenting lessons, developing teaching materials, using audiovisual equipment, developing and implementing evaluation instruments, and selecting appropriate materials within the field of interest. Requires fieldwork. *Prereq. ED 1410.*

ED 1412 Fundamentals of Curriculum Development 4 QH
Examines how goals and objectives are selected and priorities are determined. Analyzes methods for designing educational programs to meet specified goals, methods of evaluating educational outcomes in terms of the goals of the program, and techniques for modifying programs in the light of such performance.

ED 1413 Writing and the Teaching of Writing 4 QH
Studies the logical and rhetorical bases of exposition and argumentative writing; relationships of assumptions, assertions, and implications; the nature of proof in the sciences, social sciences, and humanities; strategies of argumentation; and the effective consequences of word choice and sentence structure. *Prereq. ED 1104.*

ED 1414 Current Issues in Teaching the Gifted and Talented 4 QH
Examines issues that affect the type and quality of education available to the gifted and talented in the United States. Describes and evaluates various approaches and programs and reaches conclusions about their effectiveness. Examines research findings on the needs of this segment of the population of learners in order to provide some criteria for future curriculum development.

ED 1416 Supervised Field Placement: Early Childhood 2 QH
Provides a University-arranged institutional placement that allows students to provide educational, remedial, and/or custodial services to children generally of ages two through five. Provides an opportunity to analyze, develop, demonstrate, and evaluate skills and techniques in guiding the activities of children in nursery schools, day care centers, and/or kindergartens.

ED 1417 Student Teaching and Seminar 8 QH
Allows for full-time participation in a University-arranged and -supervised school program designed to analyze learning and teaching and to demonstrate, evaluate, and develop teaching skills. *Prereq. Formal acceptance into and completion of advanced professional sequence with minimum 2.0 Q.P.A., both overall and in teaching major.*

ED 1800 Directed Study 1 4 QH
This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. Preparation consists of approval of the supervising faculty member and the dean's office of the Boston-Bouv  College of Human Development Professions. Approval forms must be submitted to the dean's office during the quarter prior to registration for the directed study. *Prereq. Permission of instructor.*

ED 1801 Directed Study 2 4 QH
For students who have completed ED 1800.

INT 1100 Beginning Computer Use 4 QH
Introduces students who are unfamiliar with software applications to computer use through general purpose software: word processing and data processing. Covers operating system commands as well as concepts relating to computer hardware and software. Suggests methods of applying the computer to study requirements in college.

INT 1330 Field Experience in Human Services 1 4 QH
Human services students are required to fulfill two fieldwork placements during the last two years of their program. Each placement consists of 150 hours on site. The type of placement varies according to the student's interest. Field experiences are supervised by University staff to maximize the student's learning opportunity.

INT 1331 Field Experiences in Human Services 2 4 QH
See course description for INT 1330. *Prereq.* INT 1330, junior or senior status, and permission of instructor.

Health, Sport, and Leisure Studies

HSL 1100 Beginning Swimming 1 QH
Focuses on basic swimming skills for non-swimmers, with emphasis on personal water safety.

HSL 1101 Intermediate Swimming 1 QH
Focuses on basic and advanced swimming skills, with emphasis on form and efficiency. *Prereq.* HSL 1100 or equiv.

HSL 1106 Beginning Scuba 2 QH
Focuses on basic skin-diving and scuba-diving skills, with emphasis on safety. *Prereq.* HSL 1101 or equiv.

HSL 1107 Sailing 1 QH
Focuses on basic skills in sailing.

HSL 1109 Beginning Gymnastics 1 1 QH
Introduces, in a coeducational approach, basic skills in floor exercise, vaulting, balance beam, parallel bars, uneven bars, high bar, and rings.

HSL 1110 Women's Gymnastics 2 1 QH
Focuses on knowledge and skills necessary to perform the beginning compulsory routines on the balance beam, floor exercise, uneven bars, and vaulting. *Prereq.* HSL 1109.

HSL 1112 Men's Gymnastics 2 1 QH
Focuses on skills and knowledge necessary to perform beginning compulsory routines on the high bar, side horse, rings, floor exercise, parallel bars, and vaulting horse. *Prereq.* HSL 1109.

HSL 1114 Badminton 1 QH
Focuses on basic badminton strokes, concepts, rules, strategies, and game play.

HSL 1116 Tennis 1 QH
Focuses on basic tennis strokes, concepts, rules, strategies, and game play.

HSL 1121 Beginning Self-Defense 1 QH
Surveys the principles and fundamental skills at the beginning and intermediate levels.

HSL 1126 Karate 1 1 QH
Focuses on fundamental techniques of unarmed combat for self-defense using the punches, kicks, and blocks of Tae Kwan Do/Karate.

HSL 1127 Karate 2 1 QH
Continues HSL 1126, with progression to more complex techniques and combinations of punches, kicks, and blocks related to Tae Kwan Do/Karate. *Prereq.* HSL 1126.

HSL 1129 Beginning Ice Skating 1 QH
Focuses on recreational ice-skating skills for beginners.

HSL 1130 Figure Skating 1 QH
Focuses on beginning and intermediate figure-skating skills. *Prereq.* HSL 1129 or permission of instructor.

HSL 1131 Yoga 1 QH
Introduces yoga skills and techniques for men and women at the beginning level.

HSL 1132 Weight Training 1 QH
Introduces the principles and use of resistive exercises: isotonic exercise (weights), isometric exercise, and the appropriateness of each.

HSL 1133 Physical Conditioning 1 QH
Focuses on assessing one's personal physical fitness level, with emphasis on establishing a personal exercise regimen based on scientific principles of training. Utilizes special sections for different mediums of exercise, such as aerobic dance techniques, running, and circuit training.

HSL 1134 Aerobic Exercise and Dance 1 QH
Focuses on aerobic fitness, with strong emphasis on concepts of exercise safety and conditioning.

HSL 1135 Yoga 2 1 QH
Focuses on refinement of poses learned in HSL 1131. Introduces more advanced standing and inverted poses, balances, and back bends. *Prereq.* HSL 1131 or equiv.

HSL 1138 Beginning Skiing 1 QH
Focuses on fundamental techniques of downhill skiing. Lab fee.

- HSL 1139 Intermediate Skiing** 1 QH
Focuses on downhill skiing, including intermediate and advanced techniques. Emphasizes skill development. Lab fee. *Prereq.* HSL 1138.
- HSL 1140 Basketball** 1 QH
Focuses on knowledge and skills appropriate for playing basketball at the beginning level.
- HSL 1142 Volleyball** 1 QH
Focuses on knowledge and skills appropriate for playing volleyball at the beginning level.
- HSL 1146 Softball** 1 QH
Focuses on knowledge and skills appropriate for playing softball at the beginning level.
- HSL 1148 Women's Lacrosse** 1 QH
Focuses on knowledge and skill appropriate for playing lacrosse at the beginning level.
- HSL 1149 Men's Lacrosse** 1 QH
Focuses on knowledge and skills appropriate to play lacrosse at the beginning level.
- HSL 1150 Soccer** 1 QH
Focuses on knowledge and skill appropriate to play soccer at the beginning level.
- HSL 1151 Movement Education** 1 QH
Focuses on concepts and techniques in movement education and exploration for elementary school educators.
- HSL 1153 Modern Dance 1** 1 QH
Introduces modern dance technique and style.
- HSL 1154 Modern Dance 2** 1 QH
Continues HSL 1153, with progression to more complex modern dance techniques and combinations. *Prereq.* HSL 1153 or equiv.
- HSL 1155 Modern Dance 3** 1 QH
Continues HSL 1154, with progression into the expressive and choreographic use of modern dance techniques. *Prereq.* HSL 1154 or equiv.
- HSL 1156 Ballet 1** 1 QH
Introduces ballet fundamentals, with emphasis on alignment.
- HSL 1157 Ballet 2** 1 QH
Continues HSL 1156, with emphasis on developing lyrical style. *Prereq.* HSL 1156 or equiv.
- HSL 1159 Jazz Dance 1** 1 QH
Introduces the fundamentals of jazz dance, with emphasis on alignment.
- HSL 1160 Jazz Dance 2** 1 QH
Continues techniques introduced in HSL 1159, with emphasis on developing jazz dance style. *Prereq.* HSL 1159 or equiv.
- HSL 1163 Ballroom Dance** 1 QH
Introduces traditional and contemporary partner dancing.

- HSL 1164 Ballroom Dance 2** 1 QH
Continues HSL 1163 with progression into more complex dance steps, partnering techniques, and amalgamations. Expands upon dances taught in HSL 1163 and introduces additional ballroom dances. *Prereq.* HSL 1163.
- HSL 1167 Beginning Racquetball** 1 QH
Focuses on knowledge and skills appropriate to play racquetball at the beginning level.
- HSL 1173 Beginning Track and Field** 1 QH
Focuses on the fundamental skills in the various track and field events.
- HSL 1220 Foundation of Leadership in Leisure Service** 4 QH
Focuses on leadership at the program level of employment in the broad field of recreation. Provides the opportunity to practice teaching skills both in the classroom and in a required field lab. Examines a variety of topics concerned with the theoretical foundations of leadership in the leisure service professions through required readings and class discussions.
- HSL 1221 Introduction to Recreation and Leisure** 3 QH
Provides an overview of the recreation park and therapeutic recreation fields, emphasizing history, scope, rationale, setting, programs and services, basic trends and issues, and future considerations. Explores the basic elements of the fields in relation to society, the leisure profession, and the individual.
- HSL 1223 Life/Career Planning** 4 QH
Helps students develop life/career planning skills for use in pursuit of a career in health, sport, or leisure studies. Explores a variety of careers, co-op job opportunities, and lifestyles of professionals in the field. Gives students the opportunity to assess their own interests, values, needs, and skills and to develop job-finding skills, including resume writing and interviewing techniques.
- HSL 1253 Group Dynamics 1** 3 QH
Introduces group dynamics through selected activities, discussion, and living and working together. Includes a resident living experience for one week at the Warren Center as an integral part of the course. Lab fee.
- HSL 1254 First Aid** 2 QH
Focuses on emergency care procedures recommended for home, school, and community, including cardiopulmonary resuscitation (CPR). Emphasizes practices endorsed by the American Red Cross.
- HSL 1255 Human Movement** 3 QH
Introduces the nature and role of human movement and analyzes skillful movement performance through participation and observation. Introduces the objectives, literature, and organization of the profession of physical education.

HSL 1257 History and Philosophy of Physical Education 3 QH
 Surveys physical education from ancient times to the present. Analyzes the influence of major philosophical positions on physical education programs.

HSL 1258 Elementary School Activities 3 QH
 Focuses on introductory knowledge and skills necessary for teaching physical education to children of elementary school age. Gives students the opportunity to learn about children's performance and appropriate teaching techniques through observation and actual experience in off-campus schools and learning centers. Partially satisfies the prepracticum requirements for teacher certification at the K-9 level.

HSL 1259 Secondary School Activities 3 QH
 Studies physical activity appropriate for secondary school students' level of development and interest. Gives students the opportunity to learn about pupils' performance and appropriate teaching techniques through observation and actual experience in off-campus schools and learning centers. Partially satisfies the prepracticum requirements for teacher certification at the grades 5–12 level.

HSL 1260 Perceptual-Motor Development 4 QH
 Studies the development of motor skills from birth through infancy, early childhood, adolescence, and adulthood, including skilled performance of the aged. Considers age expectations for perceptual-motor behavior, with a focus on a functional adequacy in skilled performance. *Prereq.* ED 1102 and ED 1103; may be taken concurrently.

HSL 1261 Anatomy and Physiology 1 4 QH
 Focuses on gross anatomy and physiology of the human skeletal, joint, nervous, and muscular systems.

HSL 1265 Early Childhood Development 4 QH
 Studies the development of fundamental motor patterns (run, catch, kick, strike, jump, throw) from ages 0 to 5 years, including perceptual-motor relations operating in vision, audition, and proprioception.

HSL 1266 Physical Conditioning Programming 2 QH
 Focuses on how to design and deliver instruction related to physical conditioning and exercises. *Prereq.* HSL 1132 and HSL 1133.

HSL 1268 Basic Athletic Training Laboratory 1 QH
 Discusses the biomechanical and anatomical principles as well as indications and contraindications for application of the various wrapping and strapping techniques involved with athletic injuries. Presents the indications for use and types of protective devices (braces, splints, and so forth). Utilizes lab time for practical application and development of skills. *Prereq.* Concurrent with HSL 1605.

HSL 1279 Foundations of Health Education 4 QH
 Introduces the health education profession including history and philosophy, professional preparation, and responsibilities of school and community health educators. Assists students in articulating the purpose, theory, concepts, and processes of health education.

HSL 1281 Current Issues in Health 4 QH
 Explores topics of current interest, which may include emotional health, nutrition, fitness, sexuality, drug use, disease, consumer issues, and environmental issues. Emphasizes the needs of the participants.

HSL 1282 Wellness 4 QH
 Explores the concept of wellness, examining behaviors and lifestyle choices that lead to a high level of physical, emotional, and spiritual well-being. Covers assessment of health risk, behavioral change, lifestyle analysis, the life cycle, and stress management through self-analysis.

HSL 1285 Health Concerns of Youth 4 QH
 Applies health concepts to assist youth in reaching a higher level of wellness through preventive measures. Identifies and deals with significant health concerns as they relate to health professionals, teachers, and adults. Partially satisfies the prepracticum requirements for teacher certification grade levels 5–12.

HSL 1286 Nutrition 4 QH
 Offers the student the opportunity to learn and evaluate nutrition information both as a consumer and a future educator. Explains the chemical, biological, and physiological bases of nutrition.

HSL 1300 Swimming Analysis 2 QH
 Focuses on theory, analysis techniques, and teaching methods in swimming. *Prereq.* HSL 1101 or permission of instructor.

HSL 1301 Analysis and Coaching of Men's Gymnastics 2 QH
 Focuses on skills analysis and coaching of men's gymnastics, with emphasis on teaching methods, new trends, and judging. *Prereq.* HSL 1113.

HSL 1302 Analysis and Coaching of Badminton 2 QH
 Focuses on analysis of performing, teaching, and coaching in badminton. *Prereq.* HSL 1115.

HSL 1303 Analysis and Coaching of Tennis 2 QH
 Focuses on analysis of performance and methods of teaching in tennis. *Prereq.* HSL 1117.

HSL 1306 Analysis and Coaching of Track/Field 2 QH
 Focuses on advanced skills analysis and coaching techniques for selected track and field events. Emphasizes analysis of common movement patterns, teaching methods, and coaching techniques. *Prereq.* HSL 1135 or equiv.

- HSL 1309 Analysis and Coaching of Basketball** 2 QH
Focuses on the basic techniques and responsibilities of coaching interscholastic and intercollegiate basketball, including advanced skills analysis, position and team play, conditioning, practice organization, and team management. *Prereq. HSL 1140.*
- HSL 1313 Analysis and Coaching of Soccer** 2 QH
Focuses on the basic techniques and responsibilities of coaching intramural, interscholastic, and intercollegiate soccer, including advanced skills analysis, position and team play, conditioning, practice organization, and team management. *Prereq. HSL 1150.*
- HSL 1315 Analysis and Coaching of Volleyball** 2 QH
Focuses on the basic techniques and responsibilities of coaching intramural, interscholastic, and intercollegiate volleyball, including advanced skills analysis, position and team play, conditioning, practice organization, and team management. *Prereq. HSL 1142.*
- HSL 1319 Analysis and Coaching of Softball** 1 QH
Focuses on basic techniques and responsibilities of coaching intramural, interscholastic, and intercollegiate softball, including advanced skills analysis and management. *Prereq. HSL 1146.*
- HSL 1320 Analysis and Coaching of Gymnastics** 2 QH
Focuses on skills analysis and coaching of women's gymnastics, with emphasis on appropriate teaching methods and new trends. *Prereq. HSL 1111.*
- HSL 1325, HSL 1326, HSL 1327 Dance Rehearsal and Performance 1, 2, 3** 1 QH each
Gives students the opportunity to develop skill in performance. Also allows students to choreograph, stage, and perform an original work or perform in the original work of a guest or faculty choreographer. *Prereq. Permission of instructor.*
- HSL 1400 Organizational Behavior** 3 QH
Studies human behavior in groups through lectures, reading, and projects. Concentrates on management skills and employment legislation.
- HSL 1401 Program Planning in Recreation** 4 QH
Examines in-depth the steps in planning recreation programs in concert with practical experience.
- HSL 1402 Leisure and Lifestyles** 4 QH
Focuses on aspects contributing to lifestyles and the role of leisure. Examines specific lifestyles through readings and videotaped movies. Gives students the opportunity to examine the effect of leisure on their lifestyles and future aspirations.
- HSL 1403 Concepts of Leisure: Sociopsychological Perspectives** 4 QH
Explores the various sociopsychological perspectives of leisure and the relations of mores, social structure, roles, values, and personality to leisure

expression. Investigates other pertinent social and environmental factors that contribute to the phenomenon of leisure.

- HSL 1406 Internship Seminar** 1 QH
Offers preparation for professional field assignment in a leisure-service setting. Focuses on identification and assessment of student career goals, analysis of previous volunteer and/or employment experience, professional involvement, and facilitation of the internship placement process.
- HSL 1408 Research Methods** 4 QH
Studies basic statistics, the use of experimental and quasi-experimental design, sampling, instrumentation, data collection, and analysis as applied in recreation and leisure studies.
- HSL 1409 Research Applications** 4 QH
Examines the use of research methods in selected professional applications ranging from the ongoing research of faculty to student-originated studies.
- HSL 1410 Senior Seminar in Contemporary Issues and Trends in Recreation and Leisure** 4 QH
Examines and discusses contemporary issues and trends in the field of recreation and leisure. Focuses on critical aspects of leisure services: legislation, consumer advocacy, professional development, research, and innovations for the improvement of service delivery.
- HSL 1421 Management of Recreation and Physical Education Programs** 4 QH
Focuses on management procedures of recreation and physical education facilities operations. Emphasizes area and facility design, personnel policies, and problem solving related to administration and management.
- HSL 1422 Program Evaluation in Recreation** 4 QH
Examines comprehensive systems for evaluating program effectiveness as it relates to the consumer of recreation services. Emphasizes developing an evaluation system for an agency of the student's choice. Draws case studies from the public, non-profit, and commercial sectors.
- HSL 1423 Commercial Recreation Marketing** 4 QH
Examines commercial and private sector recreation services. Relates case studies, workshops, and practical problems to managing leisure opportunities for resorts, country clubs, theme parks, tourism, sports clubs, manufacturing and merchandising, and industrial recreation.
- HSL 1426 Budget Analysis** 4 QH
Focuses on the study and use of analytical techniques that can improve budgeting decisions. Considers cost-effectiveness and benefit-cost analysis, efficiency measures, and pricing for solutions to capital and operating-budget problems in the non-profit and commercial recreation sectors.

HSL 1427 Survey of Recreation Facilities 3 QH
Studies fundamental management, administration, and construction concepts for a wide variety of facilities such as parks, centers, arenas, camps, and marinas.

HSL 1446 Elements of Outdoor Recreation Planning 4 QH
Explores the nature and significance of the outdoor recreation experience and how our natural resources can optimally meet people's needs. Focuses on the elements of outdoor recreation planning; identification, evaluation, assessment, and implementation. Includes relation of social groups, natural resources, and environmental concerns to outdoor recreation planning.

HSL 1460 Process of Aging 3 QH
Focuses on aging and public policy in the United States. Uses the Older American Act and related legislation to examine how the partnership among federal, state, and local agencies operate to deliver services to older people. Studies leisure needs and services in the context of congregate living, life-care communities, senior centers, and adult day health care.

HSL 1461 Camping and Outdoor Education for the Handicapped 3 QH
Focuses on innovations in outdoor learning with an emphasis on wellness, the American Indian, outdoor adventure activities, and a holistic perspective on the individual with a disability. Includes observations and practical applications.

HSL 1462 Leisure Counseling 4 QH
Provides students an opportunity to develop fundamental group counseling skills through the use of specialized strategies and traditional verbal counseling techniques. Focuses on lifestyle awareness counseling.

HSL 1463 Overview of Physical Disabilities 4 QH
Offers a holistic and humanistic approach to people with physical disabilities, including amputations, traumatic conditions, sensory impairments, and neurological, orthopedic, and cardiovascular disorders. Studies rehabilitation procedures and treatment, adjunctive therapies, prosthetics, orthotics, assistive devices, and personal care techniques.

HSL 1464 Program Planning in Therapeutic Recreation 4 QH
Examines advanced planning of comprehensive therapeutic recreation services. Focuses on systems approach to planning for individuals and groups. Includes an intensive examination of the philosophy of therapeutic recreation; the study of the functional elements of activities, current legislation, and standards for service delivery.

HSL 1466 Foundations of Psychiatric Services in Therapeutic Recreation 4 QH
Focuses on orientation to the foundations of mental health and variables affecting mental illness. Examines various psychiatric disorders and

treatment modalities and the role of activity therapy in the treatment of mental illness. Reviews contemporary trends in psychiatry that pertain to therapeutic recreation. *Prereq.* *Permission of the instructor.*

HSL 1467 Social and Psychological Impacts of Illness and Disabilities 4 QH
Explores relevant issues related to disability such as societal attitudes, self-concept, coping, family, grieving, and life restructuring through a mixture of lectures, group discussion, guest speakers, and films. Examines self in the role of change agents and care providers. *Prereq.* *HSL 1463.*

HSL 1500 Mental Health 4 QH
Investigates emotional health and well-being as they relate to total health, with emphasis on factors that influence emotional behavior. Includes various approaches to emotional health in school programs and the community.

HSL 1501 Epidemiology 4 QH
Introduces concepts and skills related to using epidemiology as a basis for understanding community health problems and planning health promotion and disease prevention programs. *Prereq.* *HSL 1506.*

HSL 1502 Communicable and Degenerative Diseases 4 QH
Focuses on the disease immunity process, with emphasis on prevalent communicable diseases in the United States today and their transmission. Also studies chronic diseases, cardiovascular diseases, cancer, diabetes, and other constitutional and degenerative diseases and disorders that affect the nation's health.

HSL 1503 Human Sexuality and Family Dynamics 4 QH
Examines sexuality from a physical, psychological, social, historical, and cultural perspective; needs and concerns about sexuality at various stages in life, including a variety of approaches to sex education in schools, community, and the family. *Prereq.* *Middlers, juniors, and seniors only.*

HSL 1504 Longevity and Aging 4 QH
Studies the biological, psychological, and sociological aspects of human aging. Considers the importance of one's current lifestyle in relation to the phenomenon of longevity and the quality of life.

HSL 1506 Evolving Patterns of Community Health Education 4 QH

Analyzes principles of community health, with emphasis on contemporary local, national, and international organizations for meeting health problems. Considers health care delivery, consumer health issues, environmental health, community resources, and the role of health education in the community.

HSL 1507 Research Seminar 2 QH
Introduces research and scientific writing, culminating in a research project in an area of special interest. *Prereq.* *ED 1306.*

HSL 1508 Senior Seminar 2 QH
Discusses current problems and new developments as they relate to health education in school and in a variety of community settings. *Prereq.* HSL 1507.

HSL 1509 Organization and Administration of Health Education Programs 4 QH
Examines principles and methods of organization and administration of school and community health education programs. Covers ethics, personnel, budget, facility management, and priorities.

HSL 1510 Health Counseling 4 QH
Identifies physical, mental, emotional, and social health problems; remedial procedures; and counseling techniques to aid health educators in dealing more effectively with various health issues. *Prereq.* Juniors and seniors only.

HSL 1511 Independent Study 1 1 QH

HSL 1512 Independent Study 2 2 QH

HSL 1513 Independent Study 3 3 QH

HSL 1514 Independent Study 4 4 QH

Provides the student with an opportunity for concentrated planning and research in a topic area of health, sport, or leisure. Requires student to submit outline of proposed study.

HSL 1515 Public Health Administration 4 QH
Presents history and overview of public health agencies and the organization of services for meeting public health needs at the local, state, federal, and international levels. Focuses on today's major health problems and services.

HSL 1516 Drug Use and Abuse 4 QH
Explores the use and abuse of drugs in our society, including prescription and OTC drugs, alcohol, and tobacco. Examines physiological, psychological, and sociological effects of drugs on humans.

HSL 1517 Death, Bereavement, and Suicide 4 QH
Presents an interdisciplinary approach to the contemporary issues involved in death and bereavement. Examines death from a lifecycle approach, including the dynamics of grief and mourning. Discusses suicide as it relates to self-concept and stress.

HSL 1585 Teaching Procedures in School and Community Health Education 4 QH
Introduces the prospective health educator to health education curriculum, techniques of planning, and pertinent methods and materials in school and community health education. Partially satisfies the pre-practicum requirements for teacher certification at grade levels 5–12. *Prereq.* ED 1104 and HSL 1285.

HSL 1600 Psychology of Sport 2 QH
Analyzes the psychological behavioral patterns and deviations of sports participants, including spectators and coaches. Emphasizes emotions,

motivation, competition, and learning factors. Discusses current sports highlights. *Prereq.* *Physical education major or permission of instructor.*

HSL 1601 Sociology of Sport and Dance 2 QH
Studies sport and dance as social institutions, including theories explaining the role of each in contemporary society and the part of each in evolving societies. *Prereq.* *Permission of instructor.*

HSL 1602 Theory of Coaching 2 QH
Analyzes learning principles, sociology, and psychology as applied to coaching individual, dual, and team sports. Presents techniques and standards of squad recruitment, organization, leadership, and coaching ethics.

HSL 1603 Theory of Play 2 QH
Examines the nature of play and cross-cultural patterns of play. Investigates selected theories of play, including Huizinga, Caillois, Sutton-Smith, and Lee.

HSL 1605 Basic Athletic Training 3 QH
Studies preventing, managing, and rehabilitating athletic injuries. Discusses the scientific basis of conditioning and psychogenic factors involved in athletics and sports medicine.

HSL 1606 Perceptual-Motor Learning 4 QH
Focuses on how information processing is involved in perceptual-motor learning and performance. Applies basic research data to learning and executing skills in a variety of sports settings. *Prereq.* PSY 1111 or equiv.

HSL 1607 Measurement and Evaluation 4 QH
Discusses construction, use, selection, and interpretation of evaluative tools applicable to health, sport, and leisure studies. Examines elementary statistical methods. *Prereq.* ED 1307.

HSL 1608 Clinical Athletic Training 2 QH
Introduces the student athletic trainer to clinical experience with an opportunity to practice the various skills for evaluation and treatment of the injured athlete. *Prereq.* HSL 1605.

HSL 1609 Advanced Athletic Training 4 QH
Focuses on the evaluating and predisposing conditions relating to heat illness, head and neck trauma, and athletic injuries. *Prereq.* HSL 1605.

HSL 1610 Anatomy and Physiology 2 4 QH
Examines gross anatomy and physiology of the human cardiovascular, respiratory, digestive, urinary, and endocrine systems. Also covers metabolism, calorimetry, and other applied topics. *Prereq.* HSL 1261.

HSL 1611 Kinesiology 4 QH
Investigates science of human motion and anatomic and mechanical principles as they relate to an understanding of skillful, efficient, and purposeful human motion. Examines the internal and external forces acting on a human body and their effects. *Prereq.* HSL 1261.

HSL 1612 Physiology of Exercise 4 QH

Studies the immediate and long-range effects of exercise on the human body, with emphasis on the cardiovascular and respiratory systems, muscles, and metabolism; physical fitness, body composition, and selected components of motor performance—assessment techniques and training principles. Introduces indirect open-circuit calorimetry and EKG monitoring. *Prereq.* HSL 1610.

HSL 1613 Laboratory in Exercise Testing and Prescription 4 QH

Presents a practicum in assessment of functional cardiovascular, muscular strength, muscular endurance, flexibility, and body composition. Gives students the opportunity to prescribe exercise programs used to improve functions through volunteer work as an exercise test technician and exercise leader in a fitness class. *Prereq.* HSL 1612.

HSL 1614 Electrocardiography 4 QH

Studies basic and intermediate electrocardiography, including cardiac function, lead systems, rate, rhythm, axis, infarction, ischemia, hypertrophy, effects of cardiovascular drugs, and effects of exercise. *Prereq.* HSL 1612.

HSL 1615 Critical Teaching Skills 4 QH

Analyzes direct and indirect, verbal and nonverbal teaching methods for classroom and activity teaching, using techniques such as microteaching, peer teaching, and simulation. Examines techniques for measuring teacher behavior, such as interaction analysis. Requires a lab experience in an education setting. Partially satisfies prepracticum requirements for teacher certification. *Prereq.* HSL 1258 or HSL 1259; prepracticum experience.

HSL 1616 Curriculum Development 3 QH

Focuses on basic foundations of curriculum development. Stresses fundamental principles and guides to curriculum organization, format, and evaluation. Includes experience using the taxonomies of education objectives and survey of existing curricula and current curriculum trends.

HSL 1618 Exercise and Activities for the Older Adult 4 QH

Studies principles of physical activity and the organization of physical activity programs for the elderly in public and private agencies. Requires research and practical applications of theory.

HSL 1625 Senior Seminar 4 QH

Provides an opportunity for senior students to discuss pertinent new topics and concepts in sports medicine. *Prereq.* Permission of instructor.

HSL 1626 Therapeutic Reconditioning for Athletic Training 4 QH

Covers principles and objectives inherent in the rehabilitation process of athletic injuries. Discusses basic rehabilitation fundamentals, as well as specific conditioning and reconditioning techniques. Exposes the student to the different types of exercise, as well as the different rehabilitative

equipment used in a rehabilitation program. Provides laboratory experiences in the application of exercise programs and use of equipment. *Prereq.* HSL 1627.

HSL 1627 Therapeutic Modalities for Athletic Training 4 QH

Presents physical agents used in athletic training with regard to their physiological effects, where in the healing process they may be used, and all indications and contraindications for use. Utilizes laboratory experiences in application of those physical agents. *Prereq.* HSL 1605.

HSL 1777 Honors Adjunct 1 QH

To be added to any four-credit course in the department when approved by the Honors Committee of Boston-Bouvé. Once approved, the adjunct information is forwarded to the honors office for dissemination to the honors membership. Allows enrollment an unlimited number of times as an adjunct to any health, sport, and leisure studies course at different times during a given academic year.

HSL 1800 Supervised Field Experience 1 6 QH

When combined with another approved field-based course (HSL 1801 or HSL 1803), offers assignment in a field setting related to the student's area of study within the curriculum, including observing and performing professional skills under the guidance of a certified cooperating field professional and college supervisor. Includes supervision, evaluation conferences, and seminars as an integral part of this experience. Taken by HSL majors not in teacher preparation.

HSL 1801 Supervised Field Experience 2 6 QH

When combined with another approved field-based course (HSL 1800 or HSL 1802), offers assignment in a field setting related to the student's area of study within the curriculum, including observing and performing professional skills under the guidance of a certified cooperating field professional and college supervisor. Includes supervision, evaluation conferences, and seminars as an integral part of this experience.

HSL 1802 Supervised Student Teaching 1 6 QH

Provides a supervised teaching experience in an approved school in which the student assumes clear instructional responsibilities for at least half of the time and full teaching responsibilities for a substantial period of time under the guidance of a certified cooperating teacher and college supervisor. Must be at the level of the teacher certification sought. Includes supervision, evaluation conferences, and seminars as an integral part of this experience. Taken by students who wish to apply for teacher certification. Allows a minimum of 300 clock hours for teacher certification to be achieved when the student successfully completes this course and HSL 1801 or HSL 1803. These courses should be taken in the same quarter.

HSL 1803 Supervised Student Teaching 2 6 QH

Provides a supervised teaching experience in an approved school in which the student assumes clear instructional responsibilities for at least half of the time and full teaching responsibilities for a substantial period of time under the guidance of a certified cooperating teacher and college supervisor. Must be at the level of the teacher certification sought. Includes supervision, evaluation conferences, and seminars as an integral part of this experience. Taken by students who wish to apply for teacher certification. Allows a minimum of 300 clock hours for teacher certification to be achieved when the student successfully completes this course and HSL 1801 or HSL 1802. These courses should be taken in the same quarter.

HSL 1805 Supervised Student Teaching 3 6 QH

Extends HSL 1802 and HSL 1803 to accommodate students pursuing certification at two levels and

who require the additional student teaching practicum of an additional 150 hours. May also be used by student teachers needing extra involvement to meet certification standards not met during HSL 1802 and HSL 1803.

HSL 1863 TAC — Special Problems 2 QH

Presents directed study in analysis and coaching of a sport or activity not offered by the department or in special scheduling situations, for example, field hockey, football, lacrosse, wrestling. *Prereq. Permission of instructor.*

HSL 1866 Special Problems 4 QH

Presents current issues and concepts in cardiovascular health and exercise for discussion. Requires an independent research paper. *Prereq. Junior and Senior CVHE majors.*

Physical Therapy

PTH 1007 Cooperative Education in Physical Therapy 1 QH

Introduces students to cooperative education and its implications for career planning in physical therapy.

PTH 1114 Introduction to Physical Therapy 1 2 QH

Provides orientation to the field of physical therapy and its role in the health professions. Explores theory and practice in applied body mechanics and basic procedures related to patient management.

PTH 1115 Introduction to Physical Therapy 2 2 QH

Provides practice in the preparation of patients and equipment for various treatment procedures. Focuses on theory demonstration and practice in heat, light, and hydrotherapy.

PTH 1118 Development Base of Human Performance 4 QH

Studies the growth and development of perceptual-motor skills from birth to old age. Considers age expectations for perceptual-motor behavior, focusing on the processes underlying developmental changes.

PTH 1202 Therapeutic Modalities in Physical Therapy Practice 3 QH

Provides practice in preparing patients and equipment for various treatment procedures using physical agents. Includes theory, demonstration, and practice in applying heat and cold modalities, hydrotherapy, ultraviolet and laser light therapies, and electrotherapy. *Prereq. PTH 1114.*

PTH 1310 Clinical Gross Anatomy 6 QH

Regionally covers the structure and function of the human body, with particular emphasis on the skeletal, muscular, nervous, and vascular components of each region. Involves lectures,

cadaver prosection, osteology labs, and surface anatomy palpation to investigate basic human anatomy and the clinical applications of anatomy lab. *Prereq. BIO 1254 and BIO 1255.*

PTH 1315 Physiology for Physical Therapists 5 QH

Covers neuromuscular, cardiovascular, and respiratory physiology applied to physical therapy. *Prereq. BIO 1254, BIO 1255, and PTH 1115.*

PTH 1320 Physical Therapy 1 2 QH

Offers theory, demonstrations, and practice of manual therapy integrated with other treatment procedures. Also covers anatomical and physiological theory and principles. Uses problem solving and case analyses. *Prereq. BIO 1254, BIO 1255, and PTH 1115.*

PTH 1325 Clinical Medicine 1 4 QH

Covers general medicine, lab medicine, and pathology as related to conditions commonly treated by physical therapists. *Prereq. BIO 1254 and BIO 1255.*

PTH 1330 Clinical Kinesiology 5 QH

Studies normal movement through analysis of muscle and joint function. Also gives clinical applications for pathological movement. Includes lab. *Prereq. PTH 1310 and PTH 1315.*

PTH 1335 Physical Therapy 2 3 QH

Covers evaluation procedures, including theory, demonstration, practice, and planning. *Prereq. PTH 1310, PTH 1315, and PTH 1320.*

PTH 1340 Physical Therapy 3 4 QH

Covers basic therapeutic exercise, including theory, demonstration practice, and planning. *Prereq. PTH 1114, PTH 1115, PTH 1310, PTH 1315, PTH 1320.*

PTH 1341 Musculoskeletal Therapeutic Exercise 5 QH

Explores the theory, planning, and practice of basic therapeutic exercise. Discusses musculoskeletal as well as basic cardiovascular principles. Offers the opportunity to apply principles from other professional courses to design treatment programs using a systematic, problem-solving approach.

Prereq. Satisfactory attainment in all prior professional courses.

PTH 1345 Clinical Medicine 2 3 QH

Focuses on orthopedic conditions and their medical, surgical, and physical therapy treatment.

Prereq. PTH 1310, PTH 1315, and PTH 1325.

PTH 1352 Psychosocial Aspects of Illness 3 QH

Examines interpersonal relationships among patients, families, health professionals, and society, with reference to the impact of and reaction to illness. *Prereq.* Satisfactory attainment in all prior professional courses.

PTH 1355 Physical Therapy 4 3 QH

Covers theory, demonstration, and practice in prosthetics, orthotics, and advanced functional training of spinal cord-injured patients. *Prereq.*

PTH 1315, PTH 1330, PTH 1335, PTH 1340, and PTH 1345.

PTH 1356 Prosthetics 1 QH

Studies theory, demonstration, and current practice in prosthetics. *Prereq.* PTH 1315, PTH 1330, PTH 1335, PTH 1341, and PTH 1345.

PTH 1360 Physical Therapy 5 4 QH

Presents theoretical basis and clinical application of integrated approaches to treatment of neurologically impaired clients. *Prereq.* Satisfactory attainment in all prior professional courses.

PTH 1361 Neurological Assessment and Adult Neurology 3 QH

Focuses on neurologically impaired adults. Includes neurological evaluations; the etiology, diagnosis, and treatment of common neurological disorders; and physical therapy management.

Prereq. Satisfactory attainment in all prior professional courses.

PTH 1366 Neuroanatomy 5 QH

Examines morphology and function of the human nervous system. Covers abnormalities of structure and function of the nervous system. Includes lecture and lab. *Prereq.* PTH 1340.

PTH 1370 Clinical Seminar 2 QH

Discusses selected topics related to clinical aspects in physical therapy. Considers interpersonal relationships, ethics, teaching-learning process, communication, group dynamics, medical-legal issues, sociocultural/socioeconomic considerations, and clinical education information. *Prereq.* Satisfactory attainment in all prior professional courses.

PTH 1375 Physical Therapy 7 2 QH

Covers theory, demonstration, and practice in electrical testing and treatment procedures.

Prereq. PTH 1335, PTH 1345, and PTH 1366.

PTH 1380 Supervised Clinical Education 1 5 QH

Introduces clinical experience that provides the student with opportunities to practice various skills in the evaluation and treatment of patients under supervision. Requires five weeks during Quarter 9 of the junior year in Massachusetts.

Prereq. Satisfactory attainment in all prior professional courses.

PTH 1385 Clinical Medicine 3 3 QH

Focuses on the pediatric and neurologic aspects of physical therapy practice, including review of symptoms, conditions, and therapeutic intervention. *Prereq.* Satisfactory attainment in all prior professional courses.

PTH 1386 Pediatric Neurology 2 QH

Focuses on the pediatric and neurologic aspects of physical therapy practice. Reviews symptoms, conditions, and therapeutic/medical intervention.

Prereq. Satisfactory attainment in all prior professional courses.

PTH 1390 Physical Therapy 6 3 QH

Covers respiratory physical therapy, including theory, demonstration, and practice in the management of medical and surgical chest conditions. Introduces respiratory mechanical equipment and cardiopulmonary resuscitation. *Prereq.* PTH 1315, PTH 1330, PTH 1335, and PTH 1340.

PTH 1391 Cardiopulmonary Rehabilitation in Physical Therapy 4 QH

Discusses the role of physical therapy in cardiac and pulmonary rehabilitation. Examines cardiopulmonary evaluation techniques, etiology, and pathology of common cardiopulmonary disorders and physical therapy management. *Prereq.*

Physical therapy students who have satisfactorily completed all prior professional courses or respiratory therapy and cardiovascular specialist majors by permission of academic adviser.

PTH 1392 Pathophysiology and Clinical Therapeutics 1 QH

Covers selected topics in pathophysiology and clinical therapeutics related to current practice in physical therapy. *Prereq.* Satisfactory attainment in all prior professional courses.

PTH 1395 Physical Therapy 5 1 QH

Continues PTH 1360. Covers neurodevelopmental treatment, neurophysiological theory, and clinical application of facilitation and inhibition techniques to enhance motor control. *Prereq.* PTH 1330, PTH 1335, PTH 1340, PTH 1345, PTH 1360, and PTH 1366.

PTH 1396 Pediatric Evaluation/Treatment

Explores evaluating and treating the motor aspects of the neuromuscularly impaired child. Focuses on analyzing normal movement patterns, recognizing movement dysfunction, and treating movement dysfunction. *Prereq. Satisfactory attainment in all prior professional courses.*

PTH 1400 Administration 4 QH

Explores concepts in administration and management applied to physical therapy. Involves seminar and discussion groups. *Prereq. PTH 1380.*

PTH 1405 Research for Physical Therapy 4 QH

Covers introduction to research design, basic statistics, analysis of scientific and medical literature, and preparation of an independent research proposal. *Prereq. Satisfactory attainment in all prior professional courses.*

PTH 1411 Physical Therapy 8 4 QH

Incorporates analysis and comparison of methods of physical therapy evaluation and treatment, with an emphasis on therapeutic exercise. Focuses on treatment planning for various problems, with emphasis on rationale and selection of treatment alternatives. Uses case study format and case simulations. Meets for three lecture hours, with the third hour in seminar format with small-group discussions. *Prereq. Satisfactory attainment in all prior professional courses.*

PTH 1415 Supervised Clinical Education 2 0 QH

Provides advanced clinical education by giving the student further opportunities to practice various phases of physical therapy under supervision in preparation for assuming the role of a qualified physical therapist. Involves assignments in Massachusetts and other states, and twelve weeks during senior year. Required for graduation from the physical therapy program. *Prereq. Satisfactory attainment in all prior professional courses.*

PTH 1420 Physical Therapy in the Health Care System 3 QH

Examines major issues affecting the delivery of health care. Emphasizes the role of the physical therapist as a member of the health team. Involves class discussion and seminar. *Prereq. PTH 1370 and PTH 1380.*

PTH 1426 Functional Assessment of the Elderly Client 3 QH

Discusses the interaction of psychological, social and physiological factors and their effects on the potential for function of the elderly client. Studies and designs assessment instruments. *Prereq. PTH 1370 and PTH 1380.*

PTH 1450 Investigative Studies 6 QH

Covers selected modules related to current practice in physical therapy; completion of research project on a volitional basis. *Prereq. Satisfactory attainment in all prior professional courses.*

PTH 1453 Advanced Muscular Assessment and Treatment 3 QH

Provides an opportunity to develop knowledge and skills in evaluating and treating joint dysfunction. Uses a problem-solving approach. *Prereq. Satisfactory attainment in all prior professional courses.*

PTH 1702 Special Topics in Physical Therapy 2 QH

Offers innovative methods of instruction and deals with areas of special interest.

PTH 1704 Special Topics in Physical Therapy 4 QH

Offers innovative methods of instruction and deals with areas of special interest.

PTH 1777 Honors Adjunct 1 QH

Constitutes an addition to any three-, four-, five-, or six-quarter-hour course in the department when approved by the honors committee of Boston-Bouvé. Once approved, the adjunct information is forwarded to the honors membership by the honors office. Allows students to enroll an unlimited number of times as an adjunct to any physical therapy course.

PTH 1800 Directed Study 2 QH

Provides experience for the student whose unique academic needs or interests cannot be adequately satisfied in the basic, entry-level curriculum of the Department of Physical Therapy. *Prereq. Permission of instructor, chair, and dean.*

HSL 1805 Supervised Student Teaching 3 6 QH

Extends HSL 1802 and HSL 1803 to accommodate students pursuing certification at two levels and who require the additional student teaching practicum of an additional 150 hours. May also be used by student teachers needing extra involvement to meet certification standards not met during HSL 1802 and HSL 1803.

HSL 1863 TAC—Special Problems 2 QH

Presents directed study in analysis and coaching of a sport or activity not offered by the department or in special scheduling situations, for example, field hockey, football, lacrosse, wrestling. *Prereq. Permission of instructor.*

HSL 1866 Special Problems 4 QH

Presents current issues and concepts in cardiovascular health and exercise for discussion. Requires an independent research paper. *Prereq. Junior and senior CVHE majors.*

Speech-Language Pathology and Audiology

SLA 1101 Introduction to Speech and Hearing 4 QH

Offers an overview of disorders of speech and hearing and their treatment, and a review of normal speech and hearing development. Requires clinical observations of persons with speech, language, and hearing disorders.

SLA 1200 Hearing Science 4 QH

Presents basic concepts related to the physics of sound, followed by an in-depth study of the anatomy and physiology of the normal hearing mechanism. In addition, discusses basic principles of psychophysics of audition. *Prereq.* SLA 1101.

SLA 1201 Anatomy and Physiology of Vocal Mechanisms 4 QH

Offers an in-depth study of the static structure, musculature, and physiology of the speech mechanism. Emphasizes current research in speech physiology. *Prereq.* SLA 1101.

SLA 1300 Developmental Semantics and Syntax 4 QH

Analyzes the emerging semantic and syntactical aspects of language in normal and atypical children. Discusses current theory and research in language acquisition. Requires clinical observations of children with normal and atypical language patterns. *Prereq.* SLA 1101.

SLA 1301 Phonetics and Developmental Phonology 4 QH

Offers basic training in auditory recognition and symbolization of phonemes and allophones in major American dialects. Stresses static and dynamic articulatory descriptions. Also includes a review of the developmental sequence of phonemic acquisition. *Prereq.* SLA 1101 and SLA 1201.

SLA 1302 Phonemic Disorders 4 QH

Provides a practical and theoretical examination of the phonemic disorders and their etiology; also

examines diagnostic tools for evaluation and methods of treatment. Requires clinical observations of persons with phonemic disorders. *Prereq.* SLA 1201, SLA 1300, and SLA 1301.

SLA 1303 Introduction to Audiology 4 QH

Focuses on the basic techniques of audiometric testing and hearing conservation, including a review of basic hearing sciences and a prepracticum and laboratory experience in hearing testing. *Prereq.* SLA 1200.

SLA 1400 Speech Science 4 QH

Examines the basic sciences involved in speech and audition, including in-depth study of the analysis of sound and the acoustic composition of speech. Emphasizes a review of current theory and research in speech reception, perception, and production. *Prereq.* SLA 1101 and SLA 1200.

SLA 1401 Fluency Disorders 4 QH

Offers a comprehensive study of the various theories and symptomatologies of stuttering from the earliest historical references through the nineteenth and twentieth centuries. Requires clinical observations. *Prereq.* SLA 1201.

SLA 1800 Directed Study 4 QH

Provides study for the student whose unique academic needs or interests cannot adequately be satisfied in any of the scheduled courses of the department. Requires approval of the supervising faculty member, the chairperson, and the Office of the Dean of the Boston-Bouv  College of Human Development Professions. Also requires that approval forms be submitted to the dean's office during the quarter prior to registration for the directed study. *Prereq.* *Permission of instructor.*

Pharmacy

PAH 1101 Health Career Seminar 1 QH

Provides students with the opportunity to determine their career goals in the health professions through activity-oriented classes and discipline-specific career information. Addresses self-assessment, career exploration, decision making, and goal implementation. Allows students to gather information about the five majors within the College of Pharmacy and Allied Health Professions.

PAH 1135 Professional Dynamics in the Health Care Delivery System 4 QH

Examines the evolution of the American health care delivery system, with emphasis on current aspects of how health care is delivered, how it is

financed, where it is delivered, and who delivers it. Discusses present and future influences in health, including health promotion, disease prevention, and environmental issues. Considers unique and collective health professional roles and responsibilities, humanistic/behavioral dimensions of health care, professional organizations, and professionalism.

PAH 1202 Anatomy-Physiology I 5 QH

Covers structure and function of cells, tissues, and organs, including the muscular, immune, and nervous systems. Includes human skeletal anatomy and cat dissection. Oriented to students in the health professions. Lab fee. *Prereq.* CHM 1122 or CHM 1102 and BIO 1107.

PAH 1204 Anatomy-Physiology 2**5 QH**

Covers structure and function of the various life-supportive systems not covered in the first quarter: cardiovascular, endocrine, gastro-intestinal, and pulmonary systems. Emphasizes in the lab the basic principles involved in understanding the functioning life systems and cell function. Lab fee. *Prereq.* PAH 1202 or permission of instructor.

PAH 1210 Anatomy-Physiology 1**4 QH**

Offers students the opportunity to take the lecture portion only of PAH 1202. *Prereq.* Permission of instructor.

PAH 1211 Anatomy-Physiology Laboratory 1**1 QH**

Offers students the opportunity to take the lab portion only of PAH 1202. *Prereq.* Permission of instructor.

PAH 1212 Anatomy-Physiology 2**4 QH**

Offers students the opportunity to take the lecture portion only of PAH 1204. *Prereq.* Permission of instructor.

PAH 1213 Anatomy-Physiology Laboratory 2**1 QH**

Offers students the opportunity to take the lab portion only of PAH 1204. *Prereq.* Permission of instructor.

PAH 1280 Biochemistry**5 QH**

Introduces the structures, functions, and metabolism of amino acids, proteins, carbohydrates, lipids, and nucleic acids. Discusses the mechanisms of enzyme reactions, enzyme kinetics, vitamins, biological oxidation reduction reactions, and bioenergetics, as well as various inborn errors of metabolism.

PAH 1776 Junior/Senior Honors Thesis**4 QH**

Provides students with the opportunity to become involved with faculty on either ongoing research projects or student-initiated scholarly activities. Encourages and assists students in writing, presenting, and publishing their research. Allows students to gain an awareness and some understanding of a discipline or area of study in the allied health professions while developing an appreciation for research methods and the process of scientific inquiry. Requires a junior/senior thesis. *Prereq.* Honors participation.

PAH 1777 Honors Adjunct**1 QH**

Designed to be attached to a predesignated professional course in the student's major and offered at the discretion of the faculty member(s) teaching the course. For further details, contact the honors office (215LA) or PAH honors advisor. *Prereq.* Honors participation, permission of instructor.

PCL 1101 Drugs—Their Uses and Actions**4 QH**

Studies background, classification, dose responses, untoward side effects, uses, and commercial preparations of a broad series of drugs. *Not open to pharmacy, respiratory therapy, or nursing majors.*

PCL 1301 Basic Pharmacology**3 QH**

Provides students an opportunity to learn the classification, mechanisms of action, and uses of a broad spectrum of therapeutic agents. Emphasizes dose response and untoward side effects. *Prereq.* Physician assistant majors or permission of instructor.

PCL 1305 Pharmacodynamics**3 QH**

Introduces pharmacologic principles, with the pharmacotherapeutics of drug groups and individual drug substances of particular importance in treatment and diagnosis of disease. *Prereq.* BIO 1120, BIO 1255, CHM 1111, and CHM 1112.

PCL 1309 Pharmacology for the Respiratory-Care Practitioner**4 QH**

Provides an orientation to pharmacology, including the scope of pharmacology; definitions; drug standards; drug legislation; names, sources, and active constituents; and pharmaceutical preparations of drugs relating to the respiratory-care practitioner.

PCL 1410 Introduction to Pathology**4 QH**

Focuses on basic concepts of pathology for the pharmacy, toxicology, and respiratory therapy majors, with emphasis on disease processes and alterations of normal biochemical mechanisms. *Prereq.* PAH 1202 and PAH 1204.

PCL 1420 Pharmacology/Medicinal Chemistry 2**6 QH**

Continues discussion of topics introduced in PMC 1419. Presents an interdisciplinary chemical and pharmacological approach to understanding drug action. Deals principally with drugs affecting the peripheral nervous, cardiovascular, and renal systems. *Prereq.* PMC 1419.

PCL 1422 Pharmacology/Medicinal Chemistry 3**6 QH**

Continues discussion of topics in PCL 1420. Covers the medicinal chemistry and pharmacology of drugs acting on the gastrointestinal, endocrine, reproductive, and hematopoietic systems, along with autocoid and antineoplastics. *Prereq.* PCL 1420.

PCL 1451 Pharmacology Laboratory**1 QH**

Provides experience in systematically monitoring the qualitative effects of selected drugs from major classes of drugs by a modified "Hippocratic Screen" technique. Studies basic quantitative characteristics of drug dose-n-response relationships, factors influencing such relationships, and general methods of calculating and reporting such data. Lab fee. *Prereq.* PMC 1418.

PCL 1801, PCL 1802, PCL 1803 Special Research Project (Pharmacology)**4 QH each**

Provides opportunity for directed study or research in pharmacology/toxicology wherein the student may undertake in-depth investigation of an area of specialized interest. Lab fee. *Prereq.* Permission of instructor and program director.

PCT 1240 Pharmaceutical Calculations 4 QH

Introduces the application of mathematical concepts in pharmacy. Emphasizes systems of measurement and basic arithmetic calculations as they relate to the practice of pharmacy. Also introduces statistical analysis methods required for subsequent courses in pharmaceuticals and for improving problem-solving skills using computers.

PCT 1310 Pharmaceuticals Laboratory 1 1 QH

Focuses on the physicochemical principles of pharmaceutical preparations and their relationship to quality control and biopharmaceutics and pharmacokinetics. *Prereq.* PCT 1340 or concurrent enrollment.

PCT 1320 Pharmaceutics Laboratory 2 2 QH

Focuses on the application of the fundamental principles and techniques of pharmaceutics to the lab preparation and use of various pharmaceutical products. *Prereq.* PCT 1350 or concurrent enrollment.

PCT 1340 Pharmaceutics 1 4 QH

Focuses on the study of physiochemical theories and principles and their application to pharmaceutical systems. Covers thermodynamics, ionic equilibria, solubility, complexation, interfacial phenomena, rheology, coarse dispersions, diffusion, membrane transport, and kinetics. *Prereq.* MTH 1108, PHY 1203, CHM 1265, and PCT 1230.

PCT 1350 Pharmaceutics 2 5 QH

Focuses on the application of the fundamental principles of physical pharmacy to the formulation of pharmaceutical preparations. Emphasizes pharmaceutical dosage forms, including both industrial formulation and extemporaneous compounding. *Prereq.* PCT 1340.

PCT 1440 Biopharmaceutics/Pharmacokinetics 4 QH

Acquaints students with biopharmaceutics and basic pharmacokinetics. Discusses dissolution, disintegration, general concept of one- and two-compartment models; linear and nonlinear pharmacokinetics; drug kinetics after intravenous, intramuscular, or oral administration; practical methods of one-compartment model utilizing urinary data; bioavailability; multiple-dosing kinetics; and general approaches to dosage adjustment in disease states. *Prereq.* PAH 1204 and PCT 1340.

PCT 1801, PCT 1802, PCT 1803 4 QH each
Pharmaceutics Special Research Project

Provides opportunity for directed study or research in one of the pharmaceutical sciences, wherein the student may undertake in-depth investigation of an area of specialized interest. Lab fee. *Prereq.* Permission of instructor(s) and program director.

PHP 1301 Pharmaceutical Jurisprudence 4 QH

Offers a comprehensive analysis and interpretation of laws relating to the practice of pharmacy. Discusses federal and state food and drug laws,

narcotics laws, Medicare and Medicaid regulations, and state pharmacy laws. *Prereq.* Permission of instructor.

PHP 1302 Pharmacy Administration 1 4 QH

Covers socioeconomic aspects of pharmacy: the government's relation to the pharmaceutical industry, trends in contemporary practice, third-party payment plans, macroeconomic impact on the industry, and the interaction of current concepts in pharmacy. *Prereq.* Permission of instructor.

PHP 1303 Interpersonal Skills for Health Professionals 4 QH

Applies the skills of interpersonal communication to situations encountered in various health care settings. Provides students with an opportunity to learn to integrate specific technical competence with serious concern for personal, social, and cultural factors in illness and health care. Through the use of medical sociology literature, audio-visual materials, case analyses, and personal reflection on actual patient encounters, provides the students with an opportunity to improve interpersonal communication skills and to increase their understanding of practitioner patient relationships, patient's needs and responses in illness and treatment, and professional behavior in practice settings.

PHP 1304 Social Pharmacology 4 QH

Studies drug-taking experiences and behaviors. Provides an overview of theories and research findings that describe the relationships between personal, social, and cultural factors and drug taking, while comparing and contrasting the social approach with the pharmacological paradigm of drug effects and the medical model of drug use. Through readings, audiovisual materials, and descriptions of personal experiences, examines the varieties of drug experiences, patterns of and reasons for drug taking of all types, and strategies for preventing drug-use problems. *Prereq.* PHP 1303 or consent of instructor.

PHP 1305 Hospital Pharmacy Management 4 QH

Examines the factors involved in the operations and management of a hospital pharmacy within the context of the total hospital structure. *Prereq.* Senior standing or permission of instructor.

PHP 1306 Community Pharmacy Management 4 QH

Focuses on the management requirements for establishing a community pharmacy. Analyzes the prevailing types of organizations, locations, leases, business organization, staffing, plant layout and design, and financial factors. *Prereq.* Senior standing or permission of instructor.

PHP 1308 Financial Management 4 QH

Examines the fundamentals of accounting and finance, with emphasis on their application to retailing and community pharmacy management. Covers accounting systems, analysis of financial

statements, budgets, cash flow, taxation, and finance in depth. *Prereq.* *Permission of instructor.*

PHP 1401 Drug Information and Evaluation 3 QH

Introduces the principles and practice of drug information. Covers the levels of practice, the availability of therapeutic reference sources, the use of abstracting and indexing systems, how to respond to drug information questions, and basic statistical data required to help understand the medical and pharmaceutical literature. *Prereq.* *Fifth-year standing or permission of instructor.*

PHP 1402 Parapharmaceuticals 2 QH

Focuses on the nature and application of various surgical devices, appliances, bandages, and hospital and sickroom supplies in patient care.

PHP 1441 Therapeutic Drug Monitoring 4 QH

Covers the monitoring, developing, and modifying of drug dosage regimens and the pharmacokinetic factors influencing the regimen selection for various therapeutic drug categories. *Prereq.* *PCT 1140.*

PHP 1501 Pharmacy Externship 4 QH

Involves a 520-hour (13 weeks x 40 hours/week) structured practicum in community pharmacy. Includes applied aspects of community pharmacy management; medication dispensing; and patient-oriented services such as prescription and nonprescription medication, consultation, and patient-profile monitoring. *Prereq.* *Fifth-year standing.*

PHP 1502 Clinical Pharmacy Clerkship 15 QH

Involves assignment to a clinical site for five full days per week to observe patient response to medication and to evaluate and advise on all factors that may modify efficacy, safety, and economy of therapy. Offers campus seminar with student presentations on current therapeutic topics. *Prereq.* *PHP 1602.*

PHP 1503 Professional Practice Laboratory 1 QH

Focuses on compounding and dispensing medications. Emphasizes patient counseling techniques and monitoring for appropriateness of therapy. Examines prescription compounding and screening for incompatibilities. Also includes an introduction to the preparation of intravenous solutions. *Prereq.* *Senior standing or permission of instructor.*

PHP 1601 Nonprescription Medication 4 QH

Provides an overview of the types of over-the-counter medications. Discusses the directions and precautions for proper use of these preparations.

PHP 1602 Pharmacotherapeutics 5 QH

Discusses common clinical lab tests, major disease states, and drug therapy for those conditions. *Prereq.* *PCL 1422 and PCL 1410.*

PHP 1603 Selected Topics in Clinical Pharmacy 1 4 QH

Helps students increase their understanding of selected diseases. Examines pathophysiology and diagnosis of the illness as well as drug therapy and

its relation to patient compliance and education. Provides greater depth than existing clinical pharmacy courses. *Prereq.* *PHP 1602 and permission of instructor.*

PHP 1604 Selected Topics in Clinical Pharmacy 2 4 QH

Helps increase the student's knowledge of selected disease entities. Examines pathophysiology and diagnosis of the illness as well as drug therapy and its relation to patient compliance and education. Provides greater depth than existing clinical pharmacy courses. *Prereq.* *PHP 1602 and permission of instructor.*

PHP 1607 Cancer Chemotherapeutics 4 QH

Emphasizes the role of chemotherapy in the management of malignant disease. Discusses clinical applications of specific chemotherapeutic agents, with the remainder of the course concentrating on specific disease states. Covers related topics such as pain control in cancer patients, control of nausea and vomiting, principles of cancer research, cancer quackery, and adverse effects of chemotherapy. *Prereq.* *Fourth-year pharmacy major or permission of instructor.*

PHP 1612 Special Topics in Pharmacy Administration 2 QH

Discusses in-depth a selected topic in the area of pharmacy administration. Topics include business, professional, and environmental management/administrative aspects of pharmacy practice in all settings. *Prereq.* *Junior or senior pharmacy majors only.*

PHP 1614 Special Topics in Pharmacy Administration 4 QH

Discusses in-depth a selected topic in pharmacy administration. Topics include business, professional, and environmental management/administrative aspects of pharmacy practice in all settings. *Prereq.* *Junior or senior pharmacy majors only.*

**PHP 1801, PHP 1802, PHP 1803, PHP 1804 4 QH each
Special Research Project**

Provides opportunity for directed study or research in clinical pharmacy or pharmacy administration, wherein the student may undertake in-depth investigation of an area of specialized interest. *Prereq.* *Permission of instructor.*

PHP 1805 Special Research Project 3 QH

Offers directed study or research in pharmacy administration, allowing for the in-depth investigation of an area of special interest. *Prereq.* *Permission of instructor.*

PHP 1806 Special Research Project 2 QH

Same as PHP 1805.

PMC 1321 Pharmaceutical Analysis and Quality Control 4 QH

Introduces the methods of pharmaceutical analysis and quality control. Reviews analytical methods—such as chromatography, titration, and

spectroscopy—and how they are applied to the evaluation of pharmaceutical products and dosage forms. *Prereq.* HM 1265.

PMC 1419 Medicinal Chemistry/Pharmacology 1 5 QH

Introduces the principles of pharmacology and medicinal chemistry. Discusses the major drug classes affecting the central nervous system, including anxiolytics, sedative-hypnotics, anesthetics, anticonvulsants, neuroleptics antidepressants, and narcotic analgesics. Considers therapeutic indications, mechanisms of action, structure-activity relations, and undesirable actions including drug abuse. *Prereq.* BIO 1107, CHM 1265, PAH 1202, and PAH 1204.

PMC 1421 Antiinfectives 5 QH

Presents an integrated approach to the study of antiinfective agents. Emphasizes the biochemical basis for the action mechanism of antibacterial,

antifungal, and antiviral agents; the chemistry of representative members of the major classes of antiinfective agents; and the pharmacology, pharmacokinetics, and therapeutic applications of drugs used to treat bacterial, fungal, and viral infections. Discusses the AIDS epidemic with a focus on investigating new drugs and treatment modalities that may be valuable in either preventing HIV replication or in the therapy of opportunistic infections. *Prereq.* BIO 1112, PAH 1280, and PMC 1419.

PMC 1801, PMC 1802, PMC 1803 Special Research Project (Medicinal Chemistry) 4 QH each

Offers directed study or research in one of the medicinal chemistry areas, wherein students may undertake in-depth investigation of an area of specialized interest. Lab fee. *Prereq.* Permission of instructor and program director.

Health Information Administration

HRA 1100 Orientation to Medical Records 1 1 QH

Focuses on the issues, activities, and opportunities in the medical record profession.

HRA 1310 Hospital Law 2 QH

Analyzes the legal principles relating to medical and paramedical practice within a hospital environment. Discusses the common law and statutory rights of the hospital, practitioner, and patient.

HRA 1320 Language of Medicine 4 QH

Studies the language of medicine, including prefixes, suffixes, roots, abbreviations, and disease, operative, and drug terms. Also includes terms related to all area specialties. Studies the terms as they relate to a specific system of the body.

HRA 1321 Language of Health Professionals 2 QH

Studies the language of medicine and health care. Emphasizes disease, procedures, and symptomatic terms and their definitions, word construction, analysis, and application. Provides the student with an opportunity to acquire knowledge of medical terminology.

HRA 1330 Foundations of Medical Science 1 3 QH

Examines the diseases most commonly encountered in the hospital, the clinic, and the home. Emphasizes disease processes that affect the body as a whole, including inflammation, immune process, infection, genetic disease, benign and malignant abnormal growth, mental illness, blood and lymph disorders, and central nervous system disease.

HRA 1340 Foundations of Medical Science 2 3 QH

Examines the diseases most commonly encountered in the hospital, the clinic, and the home.

Emphasizes disease processes that affect the body systems, including the coronary, respiratory, gastrointestinal, kidney, reproductive, hepatic, and musculoskeletal systems. *Prereq.* HRA 1330.

HRA 1410 Health Record Science 1 4 QH

Introduces health record science, the history of medicine, and the historical development of the healthcare field. Examines the medical record department, the professional medical record association, and the organization and functions of the admitting office and medical record department. Discusses definitions, standards, and development of a medical record, emphasizing its content, format, completeness, analysis, and uses. *Prereq.* Two years of arts and sciences.

HRA 1420 Health Record Science 2 4 QH

Focuses on the organization of hospitals and the medical staff, accreditation and regulation of healthcare facilities, principles of law related to patient care and medical records, and security and preservation of records and hospital statistics. *Prereq.* HRA 1410.

HRA 1430 Health Record Science 3 4 QH

Studies in depth the standardized nomenclature of diseases and operations theory and systems, emphasizing diagnostic and procedure coding with ICD-9-CM. Also covers health-facility compilation and uses of data indices. *Prereq.* HRA 1420.

HRA 1440 Advanced Health Record Science 4 4 QH

Covers advanced aspects of health/medical record science. Focuses on the management of record systems in ambulatory, long-term, home care, and psychiatric settings. *Prereq.* HRA 1430.

HRA 1450 Applied Health Records Directed Practice 1 3 QH

Offers clinical practicum in medical record science in a general hospital. *Prereq.* HRA 1430.

HRA 1460 Applied Health Records Directed Practice 2 2 QH

Offers clinical practicum in medical record science in specialized health settings. *Prereq.* HRA 1450.

HRA 1471 Applied Health Records Science 3 3 QH

Offers clinical practicum in health/medical records management in the health-care facility.

HRA 1510 Management of Health Record Services 1 4 QH

Presents introduction to management in health care. Emphasizes organization and management of health information departments in hospitals. Provides overview of management theory, systems analysis, and problem solving. Examines tools and techniques of management; organization charts, goals, and objectives; policies and procedures; work analysis. Also covers managerial behavior, Macgregor, Maslow, Hersey Blanchard, and Blake Mouton.

HRA 1520 Management of Health Record Services 2 4 QH

Focuses on the medical record department within the health-care setting. Examines budget and cost-control mechanisms, office ergonomics and layout, principles of forms design, and managing transcription services. Provides an opportunity to develop the technical skills necessary to plan and analyze budgets, design office layouts, and design forms. *Prereq.* HRA 1510.

HRA 1530 Management of Health Record Services 3 4 QH

Focuses on the medical record department within a health-care setting. Examines employee-orientation programs, training programs, in-service education, interviewing, hiring, organized labor and collective bargaining, motivating and disciplining employees, and communication skills. Provides opportunity for students to develop employee orientation and training programs and in-service presentations. Uses role playing and case studies to develop skills in interviewing, hiring, counseling, motivating, and disciplining employees. *Prereq.* HRA 1520 or permission of the instructor.

HRA 1540 Quality Assurance 4 QH

Focuses on the role of the professional review organizations and JCAHO (Joint Commission on Accreditation of Health Care Organizations) in quality assurance and on issues and problems related to designing, implementing, and evaluating quality-assurance and risk-management programs for health-care facilities. Provides opportunities for students to gain technical skills needed to carry out all aspects of the quality-assurance audit process. Emphasizes the quality-assurance professional's role as facilitator for physicians and

other health-care professionals in the quality-assurance process. *Prereq.* HRA 1320, HRA 1430, and HRA 1440, or permission of the instructor.

HRA 1560 Seminar in Health Records 2 QH

Uses case studies and discussion to integrate the discrete skills and knowledge of the professional curriculum into a meaningful whole by analysis of real and hypothetical problems. Emphasizes coordination between the seminar and applied medical record science. *Prereq.* Senior status.

HRA 1570 The Health Record Professional: Issues and Problems 2 QH

Provides senior health record students with information on a range of topics germane to their professional roles but that may not have been included in other professional courses. *Prereq.* Senior status.

HRA 1580 Training and Development for Health Care Professionals 2 QH

Prepares the health-record administration student to function as an in-service educator. Covers needs assessment, teaching techniques, and evaluation methodology.

HRA 1610 Introduction to Data Processing for the Health Professions 4 QH

Provides an introduction to computer technology and its application to health-information management. Exposes students to information analysis and processing, emphasizing file management through the use of data-base management and spreadsheet software in computer lab sessions. Addresses the use of generic software for the development of healthcare applications, current applications in health facilities, future trends, and societal issues.

HRA 1620 Systems Analysis 4 QH

Introduces systems analysis, its concepts, and techniques. Stresses special application to health-record management throughout the course. *Prereq.* HRA 1550.

HRA 1630 Introduction to Health Data Research 4 QH

Provides an introduction to the research process and to statistical analysis of research data. Also exposes students to research studies to develop an understanding of the research process, statistical analysis of health data for research studies, and evaluation of the validity and reliability of health-related research studies.

HRA 1640 Medical Computer Applications 4 QH

Examines computer applications and management of computer applications in health-care facilities, emphasizing health information systems related to medical records. Applies information flow in health facilities of clinical patient data to the principles of the information system life cycle, emphasizing systems analysis process applied to medical care and management medical record

department. Emphasizes the role of the Registered Record Administrator (RHA) as an active team member.

HRA 1800 Independent Study 4 QH

Gives students an opportunity to explore in depth a subject relevant to their interests. Gives them the opportunity to study a problem, present a proposal, carry out a study or a course of action,

and prepare both written and oral presentations of their activities. *Prereq.* Permission of instructor.

HRA 1810 HRA 1820 Special Topics 1, 2 2 QH each

Provides specialized study in medical records.

Toxicology

TOX 1100 Toxicology Orientation 1 QH

Introduces toxicology as it relates to regulatory, environmental, forensic, and clinical issues. Focuses on general principles of toxicology and their application to determining the hazards of toxicants in the workplace, the home, and the environment.

TOX 1101 Current Topics in Toxicology 1 QH

Discusses topics of interest to toxicology, pharmacy, biology, chemistry, nursing, and related majors. Selects topics from current research that span regulatory, public health, and environmental issues. Explores other toxicology-related topics.

TOX 1131 Laboratory Animal Science 4 QH

Presents a comprehensive examination of the role of the lab animal in biomedical research. Includes historical and legislative aspects of animal research, basic anatomy and physiology, genetics and nutrition, physiological parameters, animal health and disease, and experimental protocols. *Prereq.* BIO 1260, PAH 1204, and/or permission of instructor.

TOX 1300 Clinical Toxicology 4 QH

Examines the potential toxicity of drugs, commercial products, and environmental agents. Focuses on clinical manifestations, mechanisms of toxicity, principles of treatment, and prevention of acute and chronic poisonings. *Prereq.* PMC 1418.

TOX 1301 Fundamental Principles of Systemic Toxicology 4 QH

Presents the principles of toxicology from an organ-system perspective. Focuses on the basic

concepts used to evaluate toxicity, the mode of injury at the organ and cellular levels, and the basic subcellular mechanisms through which toxic agents produce damaging effects. Uses recent toxicological literature to introduce the concepts needed to evaluate toxicity through the analysis of data. *Prereq.*

PMC 1418.

TOX 1302 Chemical and Analytical Toxicology 4 QH

Continues TOX 1301. Places additional emphasis on the interpretation of the toxicological literature to evaluate the risk involved from exposure to prototype chemicals. Uses structure activity and biochemical methods of assessment to evaluate the toxicity of major classes of chemical compounds. *Prereq.* PMC 1418 and TOX 1301.

TOX 1322 Biochemical Toxicology Laboratory 4 QH

Introduces the student to investigational methods for assessing toxicity; helps develop the student's ability to analyze and interpret data generated in the lab and in the literature; and helps the student develop technical report-writing skills. Uses rodents as a model for toxic insult. Examines hepatotoxicity, neurotoxicity, teratogenicity, and other toxic manifestations at the whole-animal, whole-tissue, and biochemical levels. *Prereq.* TOX 1300, TOX 1301, or TOX 1302.

TOX 1801, TOX 1802, TOX 1803 Special Topics 4 QH each

Selected areas of toxicology will be explored. These may include research, seminars, comparative analysis of data, or faculty-guided programs.

Medical Laboratory Science

The medical laboratory professional courses are taught by University faculty and supportive clinical faculty.

MLS 1101 Medical Laboratory Science Orientation 1 1 QH

Focuses on the history and development of the medical lab science profession; includes an introduction to medical terminology.

MLS 1102 Medical Laboratory Science Orientation 2 1 QH

Continues discussion of topics introduced in MLS 1101, with the addition of a review of mathematics and metric-unit calculations.

MLS 1109 Foundations of Clinical Laboratory Science 4 QH

Examines basic lab methods employed in primary care, including urinalysis, gram staining, hematocrit, hemoglobin, sedimentation rate, white cell count, and differential. *Prereq. Admission to physician assistant program or permission by instructor.*

MLS 1112 Renal Physiology and Urinalysis 2 QH

Introduces basic medical laboratory science. Examines principles and theories of renal physiology. Emphasizes techniques for chemical and microscopic detection of normal and abnormal urinary tract constituents. *Prereq. BIO 1107 and CHM 1111.*

MLS 1123 Basic Hematology 1 2 QH

Introduces hematology procedures and principles; hemoglobin, hematocrit, white and red blood cell counts; and white cell differentiation. Replaces lecture portion of MLS 1121. *Prereq. BIO 1107 and CHM 1122.*

MLS 1124 Basic Hematology 2 2 QH

Studies the principles and procedures of hematology, emphasizing hematologic cell maturation, morphology, and basic hemostasis. Replaces lecture portion of MLS 1122. *Prereq. MLS 1123 or MLS 1321.*

MLS 1132 Basic Immunohematology 3 QH

Teaches the principles of immunohematology with specific application to the ABO and Rh blood group system, antibody detection, and crossmatch design. Studies basic blood bank techniques including blood typing and crossmatching. Replaces immunohematology lecture portion of MLS 1131. *Prereq. BIO 1107, MLS 1171 and MLS 1271.*

MLS 1141 Basic Medical Laboratory Science Clinical Microbiology 6QH

Focuses on basic principles and techniques of organism isolation, cultivation, and identification from clinical specimens. Discusses elementary serologic procedures. Lab fee. *Prereq. CHM 1122 and BIO 1107.*

MLS 1142 Basic Clinical Microbiology 1 3 QH

Introduces the principles and techniques of organism isolation, cultivation, and identification

from clinical specimens. Replaces lecture portion of MLS 1141. *Prereq. BIO 1107, CHM 1122, MLS 1171, and MLS 1271.*

MLS 1143 Basic Clinical Microbiology 2 2 QH

Focuses on basic principles and techniques of isolating, cultivating, and identifying bacteria from clinical specimens. Identifies clinically significant fungi and discusses modes and types of infections. *Prereq. MLS 1142.*

MLS 1152 Basic Clinical Chemistry and Instrumentation 4 QH

Covers the principles of clinical chemistry with application to procedures and techniques. In laboratory work, emphasizes the clinical significance and common methods of quantitating selected important analyses. Replaces lecture portion of MLS 1151. *Prereq. CHM 1122 and MLS 1112 or MLS 1311.*

MLS 1171 Basic Immunology 1 QH

Covers the concepts of medical immunology, including the relationship between disease, immune response, and laboratory procedures. Encompasses the concepts of antigen and antibody structure and relationship, specific and nonspecific host response, and common laboratory methods for detecting antibodies and antigens. Includes material previously presented as part of MLS 1131.

MLS 1212 Urinalysis Lab 1 QH

Laboratory for MLS 1112.

MLS 1223 Basic Hematology 1 Lab 1 QH

Laboratory for MLS 1123.

MLS 1224 Basic Hematology 2 Lab 1 QH

Laboratory for MLS 1124.

MLS 1232 Basic Immunohematology Lab 1 QH

Laboratory for MLS 1132.

MLS 1242 Basic Clinical Microbiology 1 Lab 1 QH

Laboratory for MLS 1142.

MLS 1243 Basic Clinical Microbiology 2 Lab 1 QH

Laboratory for MLS 1143.

MLS 1252 Basic Clinical Chemistry and Instrumentation Lab 1 QH

Laboratory for MLS 1152.

MLS 1271 Basic Immunology Lab 1 QH

Laboratory for MLS 1171.

MLS 1311 Basic Medical Laboratory Science Urinalysis 2 QH

Introduces basic medical laboratory science. Examines principles and theories of renal physiology, with laboratory emphasis on techniques for

chemical and microscopic detection of normal and abnormal urinary tract constituents. Lab fee.
Prereq. CHM 1122 and BIO 1107.

MLS 1321 Basic MLS Hematology 1 2 QH

Introduces basic hematology procedures and principles, including hemoglobin, hematocrit, white and red blood cell counts, and white cell differentiation. Lab fee. *Prereq. CHM 1122 and BIO 1107.*

MLS 1322 Basic MLS Hematology 2 2 QH

Covers principles and procedures of basic medical lab hematology, including basic hemostasis. Lab fee. *Prereq. MLS 1121 or MLS 1321.*

MLS 1412 MLT Special Topics—Applied Microscopy 2 QH

Offers clinical practicum in applied urinalysis, parasitology, and mycology at an affiliated hospital providing MLT(ASCP)- and CLT(NCA)-level instruction. *Prereq. Admission to MLT Clinical Program.*

MLS 1423 MLT Applied Study in Hematology 2 QH

Offers clinical practicum in hematology and coagulation at an affiliated hospital providing MLT(ASCP)- and CLT(NCA)-level instruction. *Prereq. Admission to MLT Clinical Program.*

MLS 1432 MLT Applied Study in Blood Banking 2 QH

Offers clinical practicum in blood banking at an affiliated hospital providing MLT(ASCP)- and CLT(NCA)-level instruction. *Prereq. Admission to MLT Clinical Program.*

MLS 1442 MLT Applied Study in Clinical Microbiology 2 QH

Offers clinical practicum in microbiology at an affiliated hospital providing MLT(ASCP)- and CLT(NCA)-level instruction. *Prereq. Admission to MLT Clinical Program.*

MLS 1452 MLT Applied Study in Clinical Chemistry 2 QH

Offers clinical practicum in clinical chemistry at an affiliated hospital providing MLT(ASCP)- and CLT(NCA)-level instruction. *Prereq. Admission to MLT Clinical Program.*

MLS 1480 MLT Seminar 1 2 QH

Offers a basic introduction to correlation of laboratory findings in hematology, blood banking, microbiology, and clinical chemistry, with appropriate referrals of lab information in working situation. Examines basic use of quality control. *Prereq. Admission to MLT Clinical Program.*

MLS 1523 Hematology MT Applied Study 4 QH

Offers clinical practicum in applied hematology at an affiliated hospital providing MT(ASCP)- and CLS(NCA)-level instruction. *Prereq. Admission to MT Clinical Program.*

MLS 1533 Immunohematology MT Applied Study 4 QH

Offers clinical practicum in applied immunohematology at an affiliated hospital providing MT(ASCP)- and CLS(NCA)-level instruction. *Prereq. Admission to MT Clinical Program.*

MLS 1544 Clinical Microbiology MT Applied Study 7 QH

Offers clinical practicum in applied microbiology at an affiliated hospital providing MT(ASCP)- and CLS(NCA)-level instruction. *Prereq. Admission to MT Clinical Program.*

MLS 1552 Clinical Chemistry MT Applied Study 7 QH

Offers clinical practicum in applied clinical chemistry at an affiliated hospital providing MT(ASCP)- and CLS(NCA)-level instruction. *Prereq. Admission to MT Clinical Program.*

MLS 1573 Clinical Immunology MT Applied Study 1 1 QH

Offers clinical practicum in applied clinical immunology at an affiliated hospital providing MT(ASCP)- and CLS(NCA)-level instruction. *Prereq. Admission to MT Clinical program.*

MLS 1574 Clinical Immunology MT Applied Study 2 1 QH

Continues MLS 1573.

MLS 1621 Advanced Hematology 1 3 QH

Studies physiology of blood cells and bone marrow; reviews physiology of blood hemopoiesis; discusses hematologic results as they relate to normal, anemic, and leukemic conditions. *Prereq. MLS 1124 or permission of instructor.*

MLS 1622 Advanced Hematology 2—Hemostasis 2 QH

Offers advanced studies in hemostasis, emphasizing factor identification and problem solving of hemostatic problems. *Prereq. MLS 1124 or permission of instructor.*

MLS 1631 Advanced Immunohematology 2 QH

Examines blood group systems, antibody identification, and advanced immunohematologic principles and procedures. Presents case studies. *Prereq. MLS 1332 or MLS 1132.*

MLS 1641 Medical Parasitology 2 QH

Identifies significant human parasites. Examines life cycles related to mode of infestation, effects on humans, and diagnostic form. (Replaces lecture portion of MLS 1642.) *Prereq. MLS 1142.*

MLS 1644 Medical Parasitology Lab 1 QH

Laboratory for MLS 1641. (Replaces laboratory section of MLS 1642.)

MLS 1648 Advanced Clinical Microbiology 4 QH

Examines host and microbial interactions in disease produced by viruses, rickettsia, chlamydia, mycoplasma, mycobacteria, anaerobic bacteria, and actinomycetes. Also covers host and microbial interactions in gastrointestinal, genitourinary, and respiratory tract infections. Discusses disease states, diagnostic procedures, and antimicrobial testing. Combines MLS 1645 and MLS 1646. *Prereq. MLS 1142 and MLS 1143.*

MLS 1654 Advanced Clinical Chemistry 1 4 QH

Includes current methodologies and instrumentation used in clinical chemistry to evaluate hormonal conditions, drug level monitoring, amino acids,

proteins, enzymes, and carbohydrates. Combines content included in MLS 1651 and MLS 1652. *Prereq.* *MLS 1152, MLS 1351, or permission of the instructor.*

MLS 1655 Advanced Clinical Chemistry 2 4 QH
Studies metabolism and procedures for nucleic acids, lipids, acid-base balance, hepatic, renal and gastrointestinal systems, as well as vitamin and trace metal blood levels. Combines content included in MLS 1652 and MLS 1653. *Prereq.* *MLS 1654 or permission of instructor.*

MLS 1661 Medical Laboratory Science Education 2 QH
Surveys current topics in medical lab science education: developing objectives, methods of evaluation and certification, clinical instruction and evaluation, medical lab science curricula, and use of media and other methods of instruction. *Prereq.* *Completion of clinical program.*

MLS 1662 Clinimetrics 2 QH
Covers measuring and improving the quality of all steps in the total testing process. Combines Deming's principles of industrial quality management with traditional practices in clinical laboratory quality assurance programs. Discusses design strategies including ordering tests, selecting methods, monitoring analytic quality, and interpreting and reporting tests. Examines each strategy's effectiveness. *Prereq.* *Completion of MLS clinical applied study.*

MLS 1665 Medical Laboratory Management 2 QH
Surveys factors that relate to effective lab administration: hospital organizational structure, principles of management and supervision, cost accounting, purchasing, inspection guidelines, legal responsibilities, and personnel relations. *Prereq.* *Completion of clinical program.*

MLS 1672 Immunopathology 3 QH
Covers the situations in which the host defense response produces the symptoms of disease. Discusses conditions that result from immunodeficiency.

ciency. Explains the role of the immune system in transplant rejection. Describes neoplasms of the immune system and discusses laboratory procedures used in the diagnosis and management of these conditions. *Prereq.* *MLS 1171.*

MLS 1680 MLS Special Topics 2 QH
Discusses current topics in the clinical lab. *Prereq.* *MLS 1111, MLS 1121, MLS 1122, MLS 1131, MLS 1141, and MLS 1151.*

MLS 1681 MLS Senior Seminar 2 QH
Reviews current undergraduate medical lab science topics.

MLS 1831 Advanced Immunology 4 QH
Discusses current topics in immunology. Includes the structure and properties of antigens and antibodies and a detailed description of the various cell types involved in immune reactivity. Other topics may include the immune response, regulation, transplantation, tumor immunology, and autoimmunity. *Prereq.* *MLS 1171.*

MLS 1832 Advanced Immunology Laboratory 1 QH
Focuses on experiments involving antigen preparation, polyclonal and monoclonal antibody production, various *in vitro* assay techniques, and certain aspects of tissue culture designed to measure cell-to-cell reactivity.

MLS 1890 Undergraduate Research 2 QH
Examines special problems in lab medicine involving individual research under the direction of a faculty member. *Prereq.* *Special permission.*

MLS 1891 MLS Current Concepts 1 QH
Discusses topics determined by recent advances in medical lab science.

Respiratory Therapy

RTH 1111 Respiratory Therapy Seminar 1 1 QH
Introduces the beginning respiratory therapy student to the role of respiratory therapists in healthcare delivery.

RTH 1112 Respiratory Therapy Seminar 2 1 QH
Introduces the beginning student to therapeutic modalities of respiratory care.

RTH 1113 Respiratory Therapy Seminar 3 1 QH
Continues discussion of topics introduced in RTH 1112, including introduction to life-support systems.

RTH 1211 Practicum in Respiratory Care 4 QH
The first course in a sequence of five designed to provide clinical experience in hospitals. Focuses on respiratory care for noncritical patients. Emphasizes infection control, medical gas administration, humidification of medical gases, aerosol therapy, chest physiotherapy, deep breathing treatments, and the administration of aerosol medications. *Prereq.* *RTH 1331, RTH 1301, RTH 1332 concurrently, and RTH 1302 concurrently.*

RTH 1301 Professional Practice Laboratory 1 1 QH

Provides practice in basic care skills through laboratory exercises and simulation of patient-care situations. Lab fee. *Prereq.* RTH 1331 concurrently.

RTH 1302 Professional Practice Laboratory 2 1 QH

Provides students with hands-on experience in working with respiratory therapy equipment. Sets up simulated patient-management problems in the lab to provide problem-solving experience. Lab fee. *Prereq.* RTH 1301, RTH 1332 concurrently.

RTH 1312 Practicum in Respiratory Care 4 QH

The second course in a sequence of five directly related to the clinical practice of various modalities of respiratory care. Focuses on treating patients with more complex cardiorespiratory disorders. *Prereq.* RTH 1332, RTH 1302, RTH 1433 concurrently, and RTH 1403.

RTH 1313 Practicum in Respiratory Care 6 QH

Provides clinical experience in hospitals. Emphasizes respiratory care for critical patients. Reviews advanced respiratory-care topics such as airway care, mechanical ventilation, and positive end expiratory pressure. *Prereq.* RTH 1433, RTH 1302, RTH 1434 concurrently, RTH 1404 concurrently.

RTH 1320 Cardiopulmonary Physiology 4 QH

Provides a detailed introduction to the clinical diagnostic procedures employed in evaluating cardiopulmonary patients and description of the etiology, pathophysiology, diagnosis, and treatment of major cardiopulmonary diseases. *Prereq.* Satisfactory completion of the first-year courses.

RTH 1321 Cardiopulmonary Disease 4 QH

Introduces clinical diagnostic procedures employed in evaluating cardiopulmonary patients and description of the etiology, pathophysiology, diagnosis, and treatment of major cardiopulmonary diseases. *Prereq.* Satisfactory completion of the first-year courses.

RTH 1331 Introduction to Patient Care 4 QH

Provides an opportunity for the student to gain knowledge and understanding of basic patient-care skills, including moving and positioning of patients, infection control, basic observation and assessment skills, and familiarity with the techniques of cardiopulmonary resuscitation. Also provides an opportunity for the development of the student's interpersonal and communication skills.

RTH 1332 Introduction to Respiratory Care 4 QH

Basic to all other professional respiratory therapy courses. Focuses on the theory and application of medical gas administration and humidity/aerosol therapy. *Prereq.* RTH 1331 and PCL 1309 concurrently.

RTH 1403 Professional Practice Laboratory 3 1 QH

Provides students with hands-on experience with respiratory therapy procedures. Sets up simulated

patient-management problems in the lab to provide problem-solving experience. Lab fee. *Prereq.* RTH 1302, RTH 1433 concurrently.

RTH 1404 Professional Practice Laboratory 4 1 QH

Provides students with an opportunity to acquire experience in working with respiratory therapy life support equipment. Sets up simulated critical-care problems in the lab to provide problem-solving experience. Lab fee. *Prereq.* RTH 1403, RTH 1434 concurrently.

RTH 1414 Clinical Seminar 1 1 QH

Discusses clinical topics and respiratory-care problems encountered during clinical practice in the hospitals. *Prereq.* RTH 1312 concurrently.

RTH 1415 Clinical Seminar 2 1 QH

Discusses clinical topics and critical-care problems encountered during clinical practice in the hospital. *Prereq.* RTH 1313 concurrently.

RTH 1433 Respiratory Care for the Medical and Surgical Patient 4 QH

Continues the introduction to respiratory therapy, as the didactic portion of beginning clinical experience on noncritical patients. Focuses on respiratory-care problems following major surgery and those problems related to medical patients. *Prereq.* RTH 1332.

RTH 1434 Respiratory Care for the Critical Patient 4 QH

The last in a sequence of three directly related to the theory of respiratory therapy procedures; designed as the didactic portion of clinical experience on critical patients. Focuses on respiratory-care problems encountered with patients in intensive care units. *Prereq.* RTH 1433.

RTH 1435 Introduction to Perinatal/Pediatric Respiratory Care 2 QH

Provides the student with the opportunity to acquire knowledge and understanding of human cardiopulmonary development from the time of conception through childhood years. Emphasizes normal as well as abnormal manifestations of pregnancy, labor, and the process of delivering. Examines methods and techniques of assessment and delivery of respiratory care related to the pediatric patient's pathophysiology of cardiopulmonary disease. *Prereq.* RTH 1434.

RTH 1505 Cardiopulmonary Laboratory Practice 1 QH

The lab portion of Cardiopulmonary Laboratory Technology. Focuses on the techniques of pulmonary functions testing, blood gas analysis, and cardiovascular testing commonly done in the clinical setting. Lab fee. *Prereq.* RTH 1535 concurrently.

RTH 1510 Perfusion Technology Practicum 1 6 QH

Provides perfusion technology students with the opportunity to develop, practice, and master skills required to perform extracorporeal circulation procedures. Also includes, but is not limited to,

current methods in autotransfusion, myocardial preservation, and intra-aortic balloon support. *Prereq.* RTH 1570.

RTH 1511 Practicum in Critical Care 1 4 QH

Allows the student to select an area of emphasis from among the following: intensive care units, neonatal-pediatrics, or extracorporeal membrane oxygenation. During the practicum courses, provides students with an opportunity to work in their specialty areas. *Prereq.* RTH 1574, RTH 1578.

RTH 1512 Practicum in Critical Care 2 4 QH

Continues RTH 1511. *Prereq.* RTH 1511.

RTH 1515 Perfusion Technology Practicum 2 6 QH

Continues RTH 1510. *Prereq.* RTH 1514, RTH 1571, and RTH 1572.

RTH 1516 Advanced Clinical Seminar 1 1 QH

Complements RTH 1571. Discusses current clinical problems related to life-support systems problems encountered in the hospital. *Prereq.* RTH 1571 concurrently.

RTH 1517 Advanced Clinical Seminar 2 1 QH

Complements a professional elective taken concurrently. Discusses current clinical problems and research related to problems encountered in the hospital. *Prereq.* RTH 1572 concurrently.

RTH 1518 Advanced Clinical Seminar 3 1 QH

Complements RTH 1511. Discusses current clinical problems and emphasizes research related to critical-care problems. *Prereq.* RTH 1511 concurrently.

RTH 1519 Advanced Clinical Seminar 4 1 QH

Continues RTH 1518. Complements RTH 1512. *Prereq.* RTH 1512 concurrently.

RTH 1535 Cardiopulmonary Laboratory Techniques 4 QH

Provides the student with an opportunity to gain knowledge and background in principles, theory, and procedures encountered in a clinical cardiopulmonary lab. Focuses on the physiological foundations of cardiopulmonary testing. *Prereq.* RTH 1321 and permission of instructor.

RTH 1570 Fundamentals of Perfusion Technology 4 QH

Applies biologic, pharmacologic, and physical principles to extracorporeal cardiopulmonary support. Focuses on the basic theory and instrumentation of perfusion technology, emphasizing circuit design and function, oxygenator theory, pump dynamics, blood recovery and autotransfusion procedures, myocardial protection techniques, intraaortic counterpulsation, aseptic techniques, and surgical procedures. Provides an opportunity to work with perfusion equipment and to develop the psychomotor skills necessary to implement perfusion procedures. Lab.

RTH 1571 Advanced Life Support Systems 1 4 QH

Introduces students to selected techniques of advanced life support applied to the critically ill patient. *Prereq.* RTH 1434.

RTH 1572 Perfusion Technology 4 QH

Introduces students specializing in perfusion technology to the theory, principles, and concepts of cardiovascular perfusion. *Prereq.* RTH 1571.

RTH 1574 Advanced Clinical Physiology 4 QH

Provides respiratory therapy students with an opportunity for an in-depth exposure to medical physiology, based on the concept of the homeostatic state and its application to the clinical setting. *Prereq.* PAH 1204 and permission of instructor.

RTH 1576 Neonatal Respiratory Care 4 QH

Provides the student with an understanding of the methods and techniques of respiratory therapy for neonatal patients. Emphasizes mechanical ventilation, newborn care, and the respiratory distress syndrome. *Prereq.* RTH 1574.

RTH 1578 Advanced Medical Monitoring 4 QH

Provides students with an opportunity for an in-depth exposure to the theory and application of physiologic monitoring systems and their use in critical-care settings. *Prereq.* RTH 1574.

RTH 1631 Management of Respiratory Care Departments 4 QH

Exposes respiratory therapy students to the techniques, theories, and tools of management that will enable them to develop a workable management system for respiratory-care departments. Provides an overview and a basic conceptual understanding of the role and the task of managing. Deals with the functions, duties, and responsibilities of managers and the things managers must do. Alternates theoretical considerations with practical applicants (cases, questions, and exercises) to enhance learning.

RTH 1632 Methods and Materials of Teaching Respiratory Therapy 4 QH

Studies the systems approach to teaching respiratory therapy. Covers development of instructional goals based on a needs assessment, behavioral learning objectives, instructional strategies, and evaluation instruments. Emphasizes the use of criterion-referenced measurement strategies to evaluate mastery of clinical skills.

RTH 1633 Student Teaching and Seminar 4 QH

Involves part-time participation (12 hours per week) in a supervised respiratory-therapy learning experience designed to provide practice with didactic, laboratory, and clinical teaching. Gives students an opportunity to demonstrate, evaluate, and develop their teaching skills. Through a one-hour seminar held weekly, discusses problems encountered in the classroom, lab, and hospital.

RTH 1634 Rehabilitation of Patients with Respiratory Disorders 4 QH

Applies a broad definition of rehabilitation to the life situations of patients with respiratory disorders. Gives students the opportunity to learn

specific skills that address the recognition and management of acute and chronic problems. Develops model systems of psychosocial as well as physical support based on these skills. Open to students in health or human service disciplines who have had clinical or field experience.

RTH 1635 Practicum in Pediatric Pulmonary Rehabilitation 1 QH

Involves counselorship under medical direction at a one-week summer camp for children with severe pulmonary disorders. Requires students to apply skills acquired in RTH 1634 in residential camp situation and to respond to medical or psychosocial problems in a manner consistent with current methods in his/her discipline. Involves group and individual discussions with the instructor to clarify insights and experiences. Requires daily case reports to document the learning process. *Prereq. RTH 1634 or permission of instructor; enrollment limited.*

RTH 1641 Fundamentals of Cardiac Catheterization 4 QH

Covers cardiovascular technology and basic concepts such as medical aseptic technique. Intro-

duces concepts related to cardiac output studies, shunt determinations, and electrophysiology. Examines the fundamental principles of intracardiac waveforms and cardiac catheterization.

RTH 1801 Directed Independent Study 1 2 QH

Offers directed study in a student's major wherein in-depth investigation of a special interest area is undertaken. *Prereq. RTH 1511 concurrently.*

RTH 1802 Directed Independent Study 2 2 QH

Offers directed study in a student's major wherein in-depth investigation of a special interest area is undertaken. *Prereq. RTH 1512 concurrently.*

RTH 1810 Continuation of Clinical 0 QH

This six-week noncredit clinical course provides perfusion technology students with the opportunity to clear grades of I (Incomplete) in RTH 1515, Practicum in Perfusion Technology 2. At the end of the six-week period, students will be reevaluated using the criteria developed for RTH 1515, and I grades will be changed to the grades earned at that time.

Nursing

NUR 1100 Introduction to Professional Nursing and the Health System 4 QH

Surveys the social, political, and economic forces that influence the nursing profession. Considers the historical development of nursing and its role and contribution to American society. Introduces the United States health sector and the social, political, and economic factors that affect health-care delivery. Views concepts of health and illness from their meanings to the general population. Encourages students to explore individual goals in the nursing profession.

NUR 1101 Introduction to the Theoretical Basis for Nursing Practice 4 QH

Introduces general concepts in professional nursing and in the nursing paradigm. Continues health, wellness, and illness issues introduced in NUR 1100. Explores the concepts of nursing process, teaching, learning, client, and adapting. Introduces observation, interview, and basic measurements as methods of collecting data in the assessment phase of the nursing process. Explores communication as an essential aspect of professional role behavior. Gives students the opportunity to practice interview and basic measurements. *Prereq. NUR 1100 or permission of instructor.*

NUR 1102 Introduction to Human Nutrition 4 QH

Explores the fundamental role of nutrition in promoting health. Studies the physiological functions of nutrients, their food sources, and recommended intakes for different age groups. Utilizes prin-

ciples from the humanities and sciences in developing nutrition concepts. Introduces the use of different diet-assessment tools to assist individuals in meeting nutrient and energy needs. Encourages students to examine their own food choices and how those choices translate into meeting recommended nutrient and energy needs. Discusses the origins of food habits and the relevance of nutrition counseling and education in nursing practice. *Prereq. NUR 1100 or permission of instructor.*

NUR 1200 Nursing Basic Human Needs 1 6 QH

Gives the opportunity to explore the professional role in a clinical setting. Building on knowledge of the Roy Adaptation Model, allows students to implement the nursing process in the four adaptive modes and also focus on psychomotor development skills. Offers students the chance to provide basic nursing care to selected clients. Through lectures and assignments, helps students utilize and explain scientific and conceptual bases for nursing activities. Explores professional responsibility in a legal and ethical framework with specific attention to the students' individual role development. *Prereq. BIO 1115, BIO 1152, BIO 1153, CHM 1111, CHM 1112, NUR 1100, NUR 1101, NUR 1102, and sophomore standing.*

NUR 1201 Nursing Basic Human Needs 2 6 QH

Allows students to continue developing in the professional role in a clinical setting. Emphasizes physical assessment and patient education. Offers students the chance to provide basic nursing care

and to continue to strengthen their understanding of the nursing process by using the Roy Adaptation Model. Through lectures and assignments, helps students expand their scientific and conceptual basis for nursing activities. *Prereq.* BIO 1120, BIO 1154, NUR 1200, and sophomore standing.

NUR 1202 Introduction to Pathophysiological Concepts for Clinical Nursing 4 QH

Focuses on Roy's Physiological Mode. Covers oxygenation, nutrition, elimination, protective mechanisms, activity/neurological functions, endocrine/regulator functions, and skin integrity. Explores how the human body uses its adaptive powers to maintain a steady state and how alterations disrupt normal processes. Reviews disease processes and implications for nursing practice. *Prereq.* BIO 1115, BIO 1120, BIO 1152, BIO 1153, BIO 1154, and sophomore standing.

NUR 1300 Nursing Common Problems 7 QH

Focuses on specific physiologic alterations in adult health and on corresponding psychosocial adaptations in client and families. Employs Roy's Adaptation Model and addresses the adaptive behaviors in its four modes. Emphasizes the physiologic mode as the client moves along the illness/wellness continuum. Allows students to assess, plan, implement, and evaluate nursing care for selected adult clients under faculty guidance in the acute clinical setting. Gives students the opportunity to administer nursing care, collaborating with faculty, clients, primary nurses, and other appropriate health team members in the clinical practicum. *Prereq.* BIO 1254, NUR 1201, NUR 1202, PSY 1112, and middler standing.

NUR 1301 Psychiatric/Mental Health Nursing 7 QH

Examines the process used by the professional nurse in facilitating the adaptive responses and goal attainment of human systems. Specifically, focuses on the study of self-concept, role functioning, and interdependence among individuals, families, and groups. Studies the interpersonal process of professional nursing and how the nurse works with client systems in their striving toward survival, growth, reproduction, and mastery. Discusses how within this process, adaptive responses are enhanced and ineffective responses are altered. Uses the Roy Adaptation Model as the framework. *Prereq.* BIO 1254, NUR 1201, PSY 1112, and middler standing.

NUR 1302 Transition 9 QH

Introduces registered nurse students to the purposes, philosophy, and conceptual framework of the baccalaureate degree program. Provides students with the opportunity to complement and validate, through guided study, knowledge of professional roles and role conflicts, communication and group process, and principles of teaching, learning, and evaluation. Uses the Roy Adaptation Model in designing and providing nursing care, specifically with aging, chronically ill, and dying

patients. Also discusses nutritional needs, with specific emphasis on aged, acute, and chronically ill clients. *Prereq.* BIO 1120, BIO 1140, BIO 1141, BIO 1253, BIO 1255, CHM 1111, CHM 1112, PSY 1111, PSY 1112, and registered nurse license.

NUR 1303 Life Crises: Analysis and Response 4 QH

Considers personal, family, and community crises identified from literature, health agency clientele, and student sources. Uses concepts from nursing, sociology, anthropology, and social psychology to assess critically the individual's experience of crisis and the approaches used by providers in human-service systems to help people in crisis. Gives students in consumer and/or health and human service roles the opportunity to critically examine the meaning of life crises in a social-cultural vs. psychopathological framework and to explore principles and creative strategies that might be used in responding constructively to crises in their own lives or in their experience as health or human-service workers. *Open to middler students in nursing, criminal justice, applied social science, and the health professions.*

NUR 1304 Independent Study Elective (Nonclinical) 2 QH

Allows students to pursue a topic more intensely than in regular coursework. Students contract with a faculty member whose background, interests, and time allow direction of in-depth study. Student and faculty member jointly develop course objectives. *Prereq.* NUR 1201.

NUR 1400 Maternal and Child Nursing 9 QH

Focuses on applying the Roy Adaptation Model in maintaining optimal health for child-bearing and child-rearing families. Using the four modes of the model, the student examines individuals and families at selected developmental stages. Presents theoretical content in four units, with the first two focusing on adaptive behaviors and the second two examining ineffective behaviors. Gives students the opportunity to assist clients in selected maternity and child-care settings in coping with the stress and stimuli that interfere with the adaptation process. *Prereq.* NUR 1300, NUR 1301, PCL 1305, PSY 1241, PSY 1242, and junior standing.

NUR 1401 Medical-Surgical Nursing 9 QH

Focuses on the effects of episodes of acute illness on individuals, families, and community. Addresses the four modes of the Roy Adaptation Model. Emphasizes the alterations and adaptations in physiology characteristic of acute episodes of illness and the nurse's role in intervention. Also discusses the impact of illness on patterns of living, the needs for health teaching, and continuity of care. Provides guided clinical experiences, emphasizing the nursing process and the skills necessary to plan and implement care for adults in an acute-care setting. *Prereq.* NUR 1300, NUR 1301, PCL 1305, PSY 1241, PSY 1242, and junior standing.

NUR 1402 Health Assessment 4 QH

Provides the student with additional theory and skills relevant to the clinical decision-making role of the nurse as a primary caretaker. Extends the student's knowledge and experience of history-taking and physical and psychosocial assessment. Emphasizes analysis and synthesis of data obtained from a holistic health assessment as an essential framework for the identification of common health abnormalities and the enhancement of the nurse's clinical decision-making skills. *Prereq. NUR 1300, NUR 1301, or NUR 1302. Open to upper-division students in nursing.*

NUR 1403 The Nurse Planner and Coordinator of Nursing Care 4 QH

Focuses on the nurse as a planner and coordinator of nursing care. Examines the theoretical base for organizing and facilitating the delivery of efficient and appropriate nursing services to client/patients across various settings. Explores concepts from nursing, organizational theory, decision-making theory, and leadership and management theory to heighten the professional nurse's awareness of the complexity of human and material resources required for the delivery of nursing care to clients and the importance of collaboration with a variety of providers. *Open to middler students in nursing.*

NUR 1404 The Nurse Entrepreneur 4 QH

Focuses on the role of the nurse as an entrepreneur. Within the generic functions of nursing, studies situations of patient family teaching that provide the framework for introducing students to the essentials of undertaking this function as a business venture. Includes the formation of a nurse entrepreneur's venture action plan to do patient and family teaching. *Open to middler students in nursing.*

NUR 1500 Community Health Nursing 9 QH

Focuses on the use of the nursing process to promote the adaptation of individuals, families,

groups, and communities. Examines utilization of the Roy Adaptation Model in addressing client needs. Analyzes the interrelationship of client and environmental factors as they relate to the attainment of health goals. Discusses the influence of the role of the community health nurse and cultural, political, socioeconomic, and epidemiological factors on client adaptation. *Prereq. NUR 1400, NUR 1401, PSY 1242, SOA 1100, and senior standing.*

NUR 1501 Contemporary Issues in Nursing 5 QH

Analyzes sociological, political, legal, economic, ethical, historical, and ideological factors affecting contemporary nursing practice and the health-care system. Synthesizes professional role issues. *Prereq. NUR 1400, NUR 1401, SOC 1100, and senior standing or permission of instructor.*

NUR 1502 Introduction to Research in Nursing 4 QH

Builds on students' prior exposure to select studies applied to nursing. Discusses and critiques qualitative and quantitative research and the value of each to the practice of nursing and to the health-care field. Examines the importance of research in nursing to both practitioner and consumer. *Prereq. NUR 1400, NUR 1401, SOA 1100, and senior standing or permission of instructor.*

NUR 1503 Advanced Clinical Care 4 QH

Builds on students' clinical nursing experiences. Focuses on analyzing, synthesizing, and prioritizing solutions to patients' problems, using the case study format. Applies concepts of pathophysiology, nutrition, pharmacotherapeutics, stress, and crisis to acutely ill clients in case simulations. Develops clinical nursing judgment with acutely ill patients in adult, maternal, and child populations. *Prereq. NUR 1400, NUR 1401, and senior standing.*

Criminal Justice

CJ 1101 Administration of Criminal Justice 4 QH

Surveys the contemporary criminal justice system from the initial contact with the offender through prosecution, disposition, incarceration, and release to the community. Emphasizes major systems of social control: police, corrections, juvenile justice, mental health systems, and their policies and practices relative to the offender. Maintains balanced study by providing legal, empirical, and sociological materials.

CJ 1112 Critical Issues in Criminal Justice 4 QH

Introduces students to the major issues and ethical considerations facing criminal justice and criminology today. Discusses six to eight major critical, moral, and ethical issues. Considers such

core topics as the death penalty, abortion, euthanasia, abolition of the insanity plea, victimless crimes (prostitution, drug abuse, gambling), and gun control. Presents these issues in the format of pros and cons; involves student presentations or debates.

CJ 1151 Introduction to Law and the Legal Process 1 4 QH

Provides an introduction to the law and the legal system of the United States. Sets forth the fundamentals of our legal process and provides a summary description of both the private and public law system. Presents an overview of the traditional structure, as well as the basic principles of law.

CJ 1152 Introduction to Law and the Legal Process 2**4 QH**

Continues the material presented in CJ 1151. Introduces basic tort and contract principles, administrative law, and governmental regulation of business, topics of particular concern to criminal justice professionals in both the public and private sectors, as well as to those students concentrating in legal studies. *Prereq.* CJ 1151 and CJ 1252.

CJ 1201 Criminology**4 QH**

Introduces the major theories of crime causation developed over the past two centuries. Explores the scope and nature of the current crime problem in the United States. Examines the characteristics of specific criminal behavior such as violent crime, property crime, organized crime, white-collar crime, and public order crime.

CJ 1251 Introduction to Criminal Law**4 QH**

Deals with the area of criminal responsibility, some of its limitations, and certain modifications substantially affecting it. Requires an ability to express in writing both the knowledge of a particular concept and the ability to identify it in a complex fact pattern and discuss its implications and ramifications.

CJ 1252 Criminal Due Process**4 QH**

Focuses on a historical evaluation of the Fourteenth Amendment and its use in making rights prescribed under the Bill of Rights applicable to the individual states. Also details the inherent problems of the Fifth and Sixth Amendments, including the effect of their implications on such matters as police practices, illegal search and seizure, and right to counsel. Expects students to be familiar with basic concepts as well as changing interpretations so they can cite cases that may stand as precedents for conclusions they draw. *Prereq.* CJ 1251.

CJ 1253 Introduction to Criminal Courts**4 QH**

Examines the role of criminal courts in the United States, the structure and organization of the court system, and the flow of cases from arrest to conviction. Focuses on the key actors in the courtroom—prosecutors, defense attorneys, judges, and court clerks—and the decision-making processes in charging, setting bail, pleading guilty, going to trial, and sentencing. Addresses prospects for reforming courts. *Prereq.* CJ 1251 and CJ 1252.

CJ 1254 Civil Liability in Criminal Justice**4 QH**

Studies the contemporary problems of civil liability affecting the criminal justice professional. Reviews cases involving police, security, probation, parole, and corrections personnel to help students understand and appreciate the legal factors, public policy issues, and methods of reducing the risk of civil liability. *Prereq.* CJ 1251, and CJ 1252.

CJ 1301 Introduction to Security**4 QH**

Examines the organization and administration of security and loss prevention programs in industry, business, and government. Emphasizes the pro-

tection of assets, personnel, and facilities and focuses on the relations between security organizations and government agencies.

CJ 1311 White-Collar Crime**4 QH**

Gives the student a basic understanding of white-collar crime. Covers such topics as the nature and extent of white-collar crime, the social-psychologic makeup of white-collar crime, typologies, current efforts directed toward controlling it, and the interagency and jurisdictional problems and the benefits of cooperation.

CJ 1314 Security Management and Supervision**4 QH**

Deals with the roles and responsibilities of the security manager. Gives special attention to the responsibilities of planning, organizing, staffing, directing, controlling, representing, and innovating. Explores the manager's responsibility in professionalizing security and other relevant issues. *Prereq.* CJ 1301 or equiv.

CJ 1318 Terrorism**4 QH**

Attempts to give the student an understanding of what terrorism is and why it has become so popular. Includes the role of news media, political consequences of terrorism, the military as a resource, and the role of the hostage.

CJ 1319 Legal Aspects of Security Management and Operations**4 QH**

Provides a comprehensive examination of the legal environment and issues affecting security operations and management. Analyzes elements of criminal, civil, property, regulatory, and business law from the perspective of organizational security management concerns. Includes legal basis of security practices, civil liability, corporate security, investigations, labor law, industrial espionage, governmental security issues, and other relevant topics.

CJ 1401 Law Enforcement Administration and Management**4 QH**

Covers the principles of police organization, administration, and management, including staff and line functions, chain of command, span of control, selection of personnel, and promotional systems. Also considers special problems such as strikes, natural and atomic disasters, narcotic traffic, and vice control.

CJ 1411 Police Operations**4 QH**

Offers a general survey of police operational procedures, including patrol, traffic, interrogations, and report writing. Uses role playing to demonstrate interviewing methods. *Prereq.* CJ 1401.

CJ 1424 Seminar in Law Enforcement**4 QH**

Specific topic in law enforcement to be announced. *Prereq.* CJ 1401, CJ 1411, and junior or senior standing.

CJ 1425 Police Discretion**4 QH**

Examines the nature and impact of discretion as it relates to police decision making. Gives attention

to various forms of police discretion and ways in which it can be structured, confined, and checked. Gives students the opportunity to examine and analyze sample police department policies and to study different formal and informal methods of developing policies. Also studies the relation of discretion to controlling police behavior and police corruption. *Prereq.* *Middler, junior, or senior standing.*

CJ 1426 Topics in Law Enforcement 4 QH
Specific topic in law enforcement to be announced. *Prereq.* *Junior or senior standing.*

CJ 1427 Topics in Criminal Justice 4 QH
Specific topic in criminal justice to be announced. *Prereq.* *Junior or seniors standing.*

CJ 1451 Criminal Justice Research 4 QH
Surveys methods for basic and applied research in criminal justice, combining statistics and research methods. Concentrates on research application by stressing discussion of the general role of research in the discipline and specific contributions advanced by studies in the literature. *Prereq.* *MTH 1010 or equiv., and middler, junior, or senior standing.*

CJ 1501 Evidence 1 4 QH
Provides students the opportunity to develop their understanding of the manner in which legal issues and disputes are resolved by trial. Focuses on the manner in which the trial system works and the reasoning behind the rules governing its operation, including rules of evidence; the mechanics of the adversary system, relevancy, reliability, and rules of exclusion based on policy considerations other than relevancy and reliability. Includes such learning tools as videotapes, mock trials, observation of actual court trials, lectures, take-home assignments, and exams. *Prereq.* *CJ 1251, CJ 1252.*

CJ 1502 Evidence 2 4 QH
Continues with reliability and rules of exclusion, based on policy considerations other than relevancy and reliability, as set forth in CJ 1501. *Prereq.* *CJ 1501.*

CJ 1512 Seminar in Law and Criminal Justice 4 QH
Specific topic in the law and criminal justice to be announced. *Prereq.* *CJ 1251, CJ 1252, and junior or senior standing.*

CJ 1513 Criminal Homicide 4 QH
Surveys the topic of homicide. Explores general murder patterns and analyzes types of homicide emphasizing mass and serial killing. Discusses criminal justice issues in apprehension, prosecution, and punishment of murder.

CJ 1601 Survey of Correctional Systems 4 QH
Offers an introduction to penology and corrections. Explores the public reaction to convicted offenders historically, while concentrating on issues and programs of contemporary corrections. *Prereq.* *CJ 1201.*

CJ 1612 Juvenile Justice 4 QH
Gives an overview of the institutional response to the problems of juvenile delinquency, juvenile misconduct, and dependent/neglected and abused children. Emphasizes the police, court, and correctional agencies that process young people. In addition, devotes attention to an understanding of the history of the system, recent legal developments, and an assessment of current proposals for reform. *Prereq.* *SOC 1100 and CJ 1201.*

CJ 1613 Probation and Parole 4 QH
Examines the nature and problems of correctional field service, both adult and juvenile. *Prereq.* *CJ 1601.*

CJ 1615 Crime and Criminal Justice: A Comparative View 4 QH
Examines the problems of crime and its control from the vantage point of the comparative perspective. Analyzes countries such as Soviet Russia, China, France, East Germany, and West Germany. Also analyzes Great Britain, Holland, Finland, and Sweden in terms of their incidence and type of deviance and crime, as well as in terms of approach to social control and prevention of crime. Examines points of divergence between these countries and the United States in perceived causes of crime and differing approaches to rehabilitation and crime prevention. *Prereq.* *CJ 1101, SOC 1100, or equiv.*

CJ 1616 Women and the Criminal Justice System 4 QH
Introduces students to issues relating to roles taken by women involved with the criminal justice system and to the system's various responses to women in these roles. Focuses on women as victims of crime, as offenders, and as practitioners. *Prereq.* *Middler, junior, or senior standing.*

CJ 1618 Victims of Crime 4 QH
Examines current theory and research regarding victims of crime. Devotes attention to concepts such as victim vulnerability and victim culpability. In addition, discusses the implications of a victim-oriented perspective for the administration of justice. Assesses current victim programs, including restitution, mediation, and compensation.

CJ 1621 Incarceration 4 QH
Offers in-depth familiarity with key reading in the history and sociology of incarceration. Topics include theories of incarceration; sentence determination; history of our incarceration systems; inmate and staff perspectives on incarceration; and special category inmates (mentally ill, rape victims, death row prisoners). Includes extensive discussion. *Prereq.* *CJ 1301, midler, junior, or senior standing; and QPA over B-. Or permission of the instructor.*

CJ 1801, CJ 1802, CJ 1803, CJ 1804 4 QH each
Directed Study

Military Science

- AIR 1110 Air Force Today 1** **1 QH**
Examines the role of the United States Air Force in the contemporary world. Surveys background, mission, and organization of the Air Force and functions of United States strategic forces. Also emphasizes development of written communication skills.
- AIR 1111 Leadership Laboratory 1** **1 QH**
Introduces the customs, traditions, and courtesies of the Air Force through guest speakers, seminars, and a field trip to an Air Force base.
- AIR 1120 Air Force Today 2** **1 QH**
Continues study of the contemporary Air Force by examining general-purpose forces, aerospace support forces, and the total force structure.
- AIR 1121 Leadership Laboratory 2** **1 QH**
Continues AIR 1111, with emphasis on the role and responsibilities of an Air Force company grade officer.
- AIR 1210 Development of Air Power** **1 QH**
Traces the history of the development of air power from balloon experiments up through World War II. Emphasizes interrelation of technology, doctrine, and historical events. Emphasizes student participation and presentations to enhance verbal skills.
- AIR 1211 Leadership Laboratory 3** **1 QH**
Emphasizes development of techniques used to direct and inform. Assigns students to leadership and management positions in the AIR 1111 programs previously described.
- AIR 1220 Development of Air Power** **1 QH**
Traces the history of airpower since 1946, with emphasis on the United States Air Force. Includes the role of air forces in conflicts and the effect of space-age technology on air power. Also examines the employment of U.S. air power in peaceful ways.
- AIR 1221 Leadership Laboratory 4** **1 QH**
Continues AIR 1211. Adds a special program in preparation for field training.
- AIR 1310 Management and Leadership 1** **4 QH**
Examines management and leadership from the point of view of the Air Force junior officer. Covers the individual motivational and behavioral processes, leadership, communication, and group dynamics to provide a foundation for the development of the junior officer's professional skills as an Air Force officer.
- AIR 1311 Leadership Laboratory 7** **1 QH**
Provides supervisory practice and exercise of leadership functions in controlling and directing activities of the cadet group. Develops leadership potential in a practical, supervised training lab.
- AIR 1320 Management and Leadership 2** **4 QH**
Continues AIR 1310 with special emphasis on the basic managerial processes involving decision making, utilization of analytical aid in planning, organizing, and controlling in a changing environment. Discusses organizational and personal values, management of forces in change, organizational power, politics, and managerial strategy and tactics in the context of the military organization. Uses actual Air Force cases to enhance the learning and communication processes.
- AIR 1321 Leadership Laboratory 8** **1 QH**
Continues AIR 1311. Emphasizes supervisory and leadership skills. Discusses advantages of an Air Force career.
- AIR 1410 National Security Forces 1** **4 QH**
Studies the military's role as an institution in a democratic society. Includes such topics as civil-military interaction and the military as a profession. Emphasizes developing communicative skills through student presentations.
- AIR 1411 Leadership Laboratory 5** **1 QH**
Focuses on exercise of management functions in planning, supervising, and directing cadet group activities. Provides opportunity to acquire proficiency in military leadership skills.
- AIR 1420 United States National Security Forces 2** **4 QH**
Studies the role of the military in maintaining the security of the United States. Examines the international environment, the background of defense policy, strategy, and forms of conflict. Addresses specific issues, including weapons acquisition, arms control, nuclear deterrence, and the national military decision-making process.
- AIR 1421 Leadership Laboratory 6** **1 QH**
Continues AIR 1411. Gives students the opportunity to prepare themselves for professional duties.
- ARM 1100 Leadership Laboratory 1** **0 QH**
Introduction of first-year ROTC students to the basic tenets of discipline and regimentation of the United States Army. Includes the basics of proper wear of military clothing, proper rendering of military courtesies, military customs and traditions, individual and group drill and ceremonies, manual of arms for the M16A1 rifle, and physical fitness training.
- ARM 1101 Introduction to Organizational Structure** **1.5 QH**
Uses the United States Army to introduce the beginning management student to the nature of organizations. Discusses types of organizational structures, the principles of organizational development, organizational evolution, vertical and

horizontal growth and mobility, organizational leadership, and the role of the entry-level manager within the organization. Focuses on the need for lower-level managers to be technically competent and skilled in various aspects of human resource management to satisfy the needs of the organization as well as to prosper personally.

ARM 1102 Leadership vs. Management Styles 1.5 QH

Teaches leadership and management concepts. Illustrates particular management skills: problem analysis and decision-making, planning and organizing, delegation and control, and interpersonal skills. Uses realistic management simulations and structured exercises to teach essential leadership skills.

ARM 1103 Winning Strategies for Small Organizations 1.5 QH

Assists students, regardless of their fields of study, in developing winning strategies through the practical application of proven management, time allocation, and planning sequence techniques specifically designed for small organizations. Introduces students to management by objective as a technique to facilitate the focusing of critical resources at the time and place most needed. Also discusses how the small organization's structure and leadership hierarchy affects goal outcome.

ARM 1200 Leadership Laboratory 2 0 QH

Presents introduction and hands-on training for second-year ROTC cadets. Includes required basic military skills, including nuclear, biological, and chemical protective training; selected weapons training; use of United States Army communications equipment; land navigation; orienteering; rappelling; and limited military vehicle maintenance training.

ARM 1201 Basic Rifle Marksmanship 1 QH

Provides instruction and practical application in basic rifle marksmanship techniques, safety, and range operations.

ARM 1202 Comparative Armies 1.5 QH

Presents an introduction to the roles and organization of the United States Army's Active, Reserve, and National Guard. Utilizing these concepts as building blocks, examines and compares armies currently affecting United States doctrine and tactics. Integrates the Soviet, Warsaw Pact, NATO, and other world forces into the course structure through the study and examination of current events inside and outside the military establishment.

ARM 1203 Military First Aid 1.5 QH

Introduces the fundamentals of military first aid. Includes evaluation of a casualty, mouth-to-mouth resuscitation, cardiopulmonary resuscitation, first aid for burns, and appropriate temperature prevention program.

ARM 1300 Leadership Laboratory 3 0 QH

Provides advanced leadership applications for the middler-year Army ROTC cadets. Includes the review and hands-on training of all basic military skills learned in the ROTC basic program of instruction. Gives middler cadets increased leadership responsibility within the cadet battalion for further development and evaluation as well as preparation for their junior year Camp All American platoon training.

ARM 1301 Land Navigation 2 QH

Presents advanced land navigation techniques to junior-year ROTC cadets. Introduces the topographic map and its commonly used symbols. Identifies common terrain features. Topics include measuring directional azimuths as well as straight line and road distance on a map; and converting azimuths, locating unknown points using the intersection, resection, and modified resection techniques. Requires the student to navigate using a map and compass.

ARM 1302 Advanced Tactical Planning 2 QH

Introduces the fundamentals of offensive and defensive combat at the squad and platoon levels. Includes unit organizations and capabilities, tactical planning, combat orders. Utilizes practical exercises placing the student in leadership roles in simulated tactical environments. Additionally, examines the proper method to conduct briefings, provide training input, and prepare, conduct, and evaluate training. *Prereq.* Basic course completion.

ARM 1303 Advanced Leadership Clinic 2 QH

Provides classroom, programmed instruction, and practical exercises (for example, land navigation, physical conditioning, weapons familiarization, and leadership) designed to prepare cadets for maximum individual performance at the six-week ROTC advanced camp. Required for all cadets attending advanced summer camp at Fort Bragg, North Carolina. *Prereq.* Basic course completion.

ARM 1305 Advanced Leadership Laboratory 5 6 QH

Provides external leadership lab conducted at Fort Bragg, North Carolina, during the summer quarter. As an intensive six-week course, includes application of leadership principles in positions at varying levels of responsibility. Also includes supplemental instruction such as physical conditioning, counseling, senior-subordinate relations, tactical doctrine, international laws of land warfare, and approaches to problem solving. Course attended by students from 123 colleges and universities from Maine to Florida. All expenses borne by the United States government, including a stipend of approximately five hundred dollars.

ARM 1400 Leadership Laboratory 4 0 QH

Gives fourth-year ROTC cadets practical application of previously learned skills, techniques,

education, and experience by assisting ROTC cadre in the conduct of ARM 1100, ARM 1200, and ARM 1300. Gives cadets an opportunity to prepare and present instruction, manage constrained resources, and supervise subordinates. Evaluates cadets based on active-duty Army criteria. Requires attendance by all fourth-year ROTC cadets enrolled in an ROTC course.

ARM 1401 Organization and Communications Skills 2 QH

Examines the theory, methods, and principles for understanding and motivating human behavior in organizations. Emphasizes the principles and dynamics of leadership. Directs those principles toward the development of leadership styles. Introduces the officer and noncommissioned officer evaluation system. Makes practical applications through the use of case studies and group processes. *Prereq. Basic course completion.*

ARM 1402 Military Law and Ethics 2 QH

Examines the issues and responsibilities imposed by law on commanders and staff officers in two broad areas: the military criminal justice system and military administrative law. Presents in-depth analysis of the responsibilities and duties of officers and noncommissioned officers operating in the military justice system. Focuses on the legal basis for command and on administrative due process, judicial review of military activities, and other topical issues. Gives students the opportunity to address and develop an understanding of the need for ethical conduct, and an awareness and sensitivity to ethical issues. *Prereq. Basic course completion.*

ARM 1403 Leadership Seminar and Ethics 2 QH

Provides senior ROTC cadets with need-to-know information that facilitates their entry into active duty. Also provides a forum for the study of personnel, training, logistical, and installation support systems. Discusses personal finances as well as the officer and noncommissioned officer evaluation systems. Gives students the opportunity to address and develop an understanding of the professional ethics of officership, including the need for ethical conduct, and an awareness of and sensitivity to ethical issues. *Prereq. Basic course completion.*

NAV 1100 Naval Science Laboratory 0 QH

Focuses on either drill instruction or practical work to complement classroom instruction. Must be taken in each class quarter by all NROTC students.

NAV 1101 Introduction to Naval Science 3 QH

Presents a general introduction to the naval profession and the concepts of seapower. Emphasizes the mission, organization, and warfare components of the United States Navy and Marine Corps. Includes an overview of officer and enlisted ranks and rates, training and education, and career patterns. Also covers naval courtesy and customs, military justice, leadership, and nomenclature.

Exposes the student to the professional competencies required to become a naval officer.

NAV 1102 Naval Ships Systems 1 4 QH

Studies in detail ship characteristics and types, including ship design, hydrodynamic forces, stability, compartmentation, propulsion, electrical and auxiliary systems, interior communications, ship control, and damage control. Includes basic concepts of the theory and design of steam, gas turbine, and nuclear propulsion. Also discusses shipboard safety and firefighting. *Not required for nursing students.*

NAV 1201 Naval Ships Systems 2 4 QH

Outlines the theory and employment of weapons systems. Explores the processes of detection, evaluation, threat analysis, weapon selection, delivery, guidance, and explosives. Discusses fire control systems and major weapons types, including capabilities and limitations. Describes the physical aspects of radar and underwater sound in detail. Explores the facets of command, control, and communications as a means of weapons system integration. *Not required for nursing students.*

NAV 1202 Seapower and Maritime Affairs 3 QH

Surveys United States naval history from the American Revolution to the present with emphasis on major developments. Includes an in-depth discussion of the geopolitical theory of Mahan. Also treats present-day concerns in seapower and maritime affairs, including the economic and political issues of merchant marine commerce, the law of the sea, the Russian navy and merchant marine, and a comparison of United States and Soviet naval strengths.

NAV 1301 Navigation and Naval Operations 1 4 QH

Studies piloting and celestial navigation, including theory, principles, and procedures. Focuses on piloting navigation, including the use of charts, visual and electronic aids, and the theory and operation of magnetic and gyro compasses. Covers celestial navigation in depth, including the celestial coordinate system, an introduction to spherical trigonometry, the theory and operation of the sextant, and a step-by-step treatment of the sight reduction process. Gives students the opportunity to develop practical skills in both piloting and celestial navigation. Discusses other topics such as tides, currents, effects of wind and weather, plotting, use of navigation instruments, types and characteristics of electronic navigation systems, and the day's work in navigation. *Not required for nursing students.*

NAV 1302 Navigation and Naval Operations 2 4 QH

Studies the international and island rules of the nautical road, relative-motion vector-analysis theory, relative motion problems, formation tactics, and ship employment. Also includes an introduction to naval operations and operations

analysis, ship behavior and characteristics in maneuvering, applied aspects of ship handling, and afloat communications. *Not required for nursing students.*

NAV 1310 Evolution of Warfare 4 QH

Traces the development of warfare from the dawn of recorded history to the present, focusing on the impact of major military theorists, strategists, tacticians, and technological developments. Gives the student the opportunity to acquire a basic sense of strategy, to develop an understanding of military alternatives, and to see the impact of historical precedent on military thought and action. *Not required for nursing students.*

NAV 1401 Leadership and Management 1 3 QH

Studies at an advanced level organizational behavior and management in the context of the naval organization. Includes such topics as the management functions of planning, organizing, and controlling; individual and group behavior in organizations; and motivation and leadership. Explores major behavioral theories in detail. Investigates practical applications by the use of experiential exercises, case studies, and lab discussions.

Develops other topics, including decision making, communication, responsibility, authority, and accountability.

NAV 1402 Leadership and Management 2 3 QH

Studies naval junior officer responsibilities in naval administration. Exposes the student to a study of counseling methods, military justice administration, naval human resources management, directives and correspondence, naval personnel administration, material management and maintenance, and supply systems. As the capstone course in the NROTC curriculum, builds on and integrates the professional competencies developed in prior course work and professional training.

NAV 1410 Amphibious Warfare 4 QH

Surveys the historical development of amphibious doctrine and the conduct of amphibious operations. Emphasizes the evolution of amphibious warfare in the twentieth century, especially during World War II. Explores present-day potential and limitations on amphibious operations, including the rapid deployment force concept. *Not required for nursing students.*

Cooperative Education

COP 1135 Professional Development for Journalists 1 QH

Provides current career information in the field of journalism. Prepares journalism students for the cooperative education experience as well as introducing them to the academic preparation necessary to pursue a successful career in the journalist profession. Focuses on effective resume writing, letters of application, and interviewing techniques specifically geared to those who intend to pursue a career in journalism.

COP 1180 Career Decision-Making 4 QH

Focuses on needs and concerns of students who may be undecided or uncertain about their academic major or career direction. Addresses the needs of the group, as well as individual participants, and emphasizes self-assessment, career exploration, decision making, and goal setting. *Prereq. Freshmen or sophomores in any major or permission of instructor.*

COP 1220 Working in the United States 4 QH

As a career development course for international students in their first-through-third years, helps students compete more effectively for cooperative education positions in the United States and

assists them in their cultural transition into the American work force. Considers work-oriented cross-cultural issues, the American work ethic, skills development, resume writing, and interviewing techniques. *Prereq. International students in first or second year in the United States only.*

COP 1314 Life/Career Planning 4 QH

Focuses on career exploration, self-assessment, job-search techniques, and networking. Requires students to prepare a professional resume, to participate in videotaped mock interviews, to research careers, and to investigate graduate and professional schools. *Prereq. Junior or senior in any major standing or permission of instructor.*

COP 1353 Professional Development for Education 1 QH

Examines career management issues for fourth-year students. Discusses work and personal values, current issues in the employment market, planning for graduate study, organizing and conducting a job search, advanced resume preparation, and interviewing techniques.

Alternative Freshman-Year Program

The following courses will be offered in the Alternative Freshman-Year Program during the 1991–1992 academic year.

ECN 4601 Economics 1

4 QH

Examines development of macroeconomic analysis, national income concepts, national income determination fluctuation and growth, role of the banking system and the Federal Reserve System, government expenditures and taxation, international trade, and balance of international payments.

ED 4001 Integrated Language Skills Development 1

2 QH

Strives to improve a student's reading comprehension and related study and language skills. Devotes time, discussion, and considerable practice to meaning skills such as basic reading comprehension and interpretation, including work in critical reading and other interpretational acts (inferences, understanding imagery, and symbolic usage). Focuses on study skills, previewing, finding main ideas and details, outlining and summarizing, continuous interaction, and interaction of all the communications skills—reading, writing, listening, and speaking.

ED 4002 Integrated Language Skills Development 2

2 QH

Continues discussion of topics introduced in ED 4001. *Prereq.* ED 4001.

ED 4003 Integrated Language Skills A

4 QH

Strives to improve a student's reading comprehension and related study and language skills. Devotes time, discussion, and considerable practice to meaning skills such as basic reading comprehension and interpretation, including work in critical reading and other interpretational acts (inferences, understanding imagery, and symbolic usage). Focuses on study skills, previewing, finding main ideas and details, outlining and summarizing, continuous interaction, and interaction of all the communications skills—reading, writing, listening, and speaking.

ED 4004 Integrated Language Skills B

4 QH

Extends ED 4003, with continued emphasis on study skills, including researching, organizing, and writing term papers. Explores critical thinking as it relates to the learning process. Also addresses the choices of academic major and career direction, emphasizing self-assessment and personal decision making. *Prereq.* ED 4003.

ENG 4013 Fundamentals of English 1

4 QH

Presents an intensive introduction to the principles of effective expository writing. Emphasizes description, paragraph construction, and organization. Reviews English usage, punctuation, and syntax. Includes essay assignments.

ENG 4014 Fundamentals of English 2

4 QH

Presents intensive instruction in exposition, argument, and academic essay writing and includes instruction in the writing of a research paper. Continues emphasis on English usage, punctuation, and syntax. Includes essay assignments.

HST 4110 History of Civilization A

4 QH

Covers the major ideas and institutions of civilization from ancient times to 1648.

HST 4111 History of Civilization B

4 QH

Continues HST 4110, covering the period since 1648.

MGT 4110 Survey of Business and Management

4 QH

Offers an introduction to the setting and general structure of American business, the characteristics of private enterprise, and the nature and challenge of capitalism and other forms of economic enterprise. Discusses the forms of business, the structure of organization, and the functions of management in the context of their influence on the various forms of business. Through lecture and class discussion, the student gives an overview of the methodologies used in planning, organizing, directing, and controlling the functions of production, marketing, sales, pricing, and finance.

MTH 1000 Mathematical Preliminaries 1

4 QH

Reviews precollege mathematics, primarily arithmetic. Covers operations with numbers, fractions, decimals, percents, and graphs (pictographs, bar graphs, circle graphs, etc.), together with applications of these skills and concepts.

MTH 1010 Mathematical Preliminaries 2

4 QH

Surveys precollege algebra, including signed numbers, exponents, multiplication of polynomials, factoring, linear equations, graphing, and radicals. For students whose background in algebra is weak.

MTH 1113 College Mathematics for Business

4 QH

Examines sets, rectangular coordinates and graphs, functions and functional notation, linear and quadratic functions, exponential and logarithmic functions, systems of linear equations, summations, inequalities, permutations and combinations, elementary probability concepts, compound interest, and annuities.

POL 4106 Introduction to Politics

4 QH

Studies the basic political concepts and forces of organization from the classical Greeks to the modern nation-state. Contrasts the Soviet Union and the United Kingdom as contemporary illustrations of the institutional distinction between a totalitarian and a constitutional system.

SOC 4010 Principles of Sociology 1 4 QH

Introduces basic concepts and theories relating to the study of humans as participants in group life. Emphasizes socialization, culture, social structure, primary groups, family, social stratification, and population.

SOC 4011 Principles of Sociology 2 4 QH

Continues SOC 4010. Emphasizes critical analysis of American society, with attention to problems of social, political, urban, and industrial change.

Appendix

Academic Calendar 1991–1992

September 1991

2	Monday	Labor Day. University closed.
3–6	Tuesday–Friday	Final examinations for Basic Colleges.
9–18	Monday–Wednesday	Division A vacation.
12	Thursday	Fall commencement.
16	Monday	Freshman and transfer students orientation and University registration.
19	Thursday	Upperclass registration (Division A) 9 AM.
18–20	Wednesday–Friday	Continuation of course advising, course registration, course drop/add periods, and orientation for college day programs.
23	Monday	Classes begin in Basic Colleges for fall quarter at 8 AM.

October 1991

14	Monday	Columbus Day. University closed.
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November 1991

11	Monday	Veterans Day. University closed.
28–30	Thursday–Saturday	Thanksgiving Day recess.

December 1991

9–13	Monday–Friday	Final examinations for Basic Colleges.
16–Jan. 3	Monday–Friday	Christmas vacation.

January 1992

1	Wednesday	New Year's Day. University closed.
6	Monday	Orientation and registration for new freshmen and transfers; registration for continuing September freshmen and returning upperclass students (Division B).
7	Tuesday	Registration, orientation, and course drop/add continues until noon.
8	Wednesday	Classes begin in Basic Colleges for winter quarter at 8 AM.
20	Monday	Martin Luther King, Jr.'s Birthday observed. University closed.

February 1992

17	Monday	Presidents Day. University closed.
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March 1992

23-27	Monday-Friday	Final examinations for Basic Colleges.
30-April 4	Monday-Saturday	Division B vacation.

April 1992

6	Monday	Orientation and registration for transfer students, continuing freshmen, and returning upperclass students.
7	Tuesday	Registration, orientation, and course drop/add continues until noon.
8	Wednesday	Classes begin in Basic Colleges for spring quarter at 8 AM.
20	Monday	Patriots Day. University closed.

May 1992

25	Monday	Memorial Day. University closed.
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June 1992

15-19	Monday-Friday	Final examinations for Basic Colleges.
20	Saturday	Commencement.
22-26	Monday-Friday	Division A vacation.
29	Monday	Registration for Division B and D and January freshmen (Quarter 3). Beginning of summer quarter.
30	Tuesday	Basic College classes begin at 8 AM.

July 1992

4	Saturday	Independence Day. University closed.
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September 1992

7	Monday	Labor Day. University closed.
8-11	Tuesday-Friday	Final examinations for Basic Colleges.
14-23	Monday-Wednesday	Division B vacation.
17	Thursday	Fall commencement.
21	Monday	Beginning of 1992-1993 academic year. Orientation week for new students. Registration and advising week for all returning upperclass students and all new students.
28	Monday	Classes begin for Basic Colleges for fall quarter at 8 AM.

Calendar dates are subject to change. The University community will be notified if such changes are necessary.

University Registrations

Winter 1992	January 6	Monday
Spring 1992	April 6	Monday
Summer 1992	June 29	Monday
Fall 1992		
New Students	September 21	Monday
Upperclass	September 24	Thursday

Course Registrations: Thursdays, 7:30 AM, Ell Ballroom

Winter 1992	October 24	Course registration 2
Spring 1992	November 7	Course registration 1
	January 30	Course registration 2
Summer 1992	February 20	Course registration 1
	April 23	Course registration 2
Fall 1992	May 14	Course registration 1
	July 30	Course registration 2

Course Registrations: Drop/Add

Winter 1992	November 13, 15
	December 9, 10, 11
Spring 1992	November 26, 27
	February 19, 21
	March 25, 26, 27
Summer 1992	March 11, 13
	May 13, 15
	June 17, 18, 19
Fall 1992	June 2, 3
	September 9, 10, 11

Grades Deadline: All Grades Mailed the Following Day

Fall 1991	December 17
Winter 1992	March 31
Spring 1992	June 23
Summer 1992	September 15

Mission Statement

Northeastern University's mission, as a large urban university founded on the cooperative model of education, is to provide individuals with the opportunity for upward mobility through excellence in education. The University achieves its mission through curricula that value equally knowledge for its own sake, knowledge as a means to success in the workplace, and knowledge as a cornerstone of personal achievement and satisfaction.

Achieving Northeastern University's mission requires excellence in teaching, and teaching remains the central activity of Northeastern's faculty. By offering undergraduate and graduate programs that are rigorous, relevant, and rewarding, the University provides a solid structure for educational excellence. Northeastern University is also committed to the search for knowledge through the scholarly and artistic undertakings of its faculty and students.

A central mandate of Northeastern University is to offer students the opportunity to apply directly lessons of the classroom and laboratory to the workplace through cooperative education. For three quarters of a century, cooperative education has been the keystone of Northeastern's uniqueness. As an increasing percentage of the nation's population enters the workforce, and new technologies continue to change the nature of work, the University has rededicated itself to helping the cooperative plan keep pace with those changes.

Northeastern University is committed to serving the educational needs of a diverse student population in an amenable physical environment. The University believes that its mission can be achieved only if the student body is not limited by economic status, cultural or racial background, geographic origin, sex, or age. Northeastern has a long history of serving the educational needs of the nontraditional student, providing degree and nondegree programs for people whose circumstances prevent them from following the standard college regimen.

Looking beyond the confines of the campus, Northeastern University is determined to maintain and strengthen its reputation as a friend to the City of Boston and a partner of the Commonwealth of Massachusetts. The University's obligation to serve the community of which it is an integral part is fulfilled primarily through the educational enterprise. Through its numerous outreach programs, the University has made striking contributions to the community in the applied social sciences, in high technology, and in the arts. Northeastern University will continue to contribute in these and other ways to the region's overall quality of life and to its economic vitality.

Accreditation Statement

Northeastern University is accredited by the New England Association of Schools and Colleges, Inc., a nongovernmental, nationally recognized organization whose collegiate institutions include elementary schools through collegiate institutions offering postgraduate instruction. Accreditation of an institution by the New England Association indicates that it meets or exceeds criteria for the assessment of institutional quality periodically applied through a peer group review process. An accredited school or college is one which has available the necessary resources to achieve its stated purposes through appropriate educational programs, is substantially doing so, and gives reasonable evidence that it will continue to do so in the foreseeable future. Institutional integrity is also addressed through accreditation.

Accreditation by the New England Association is not partial but applies to the institution as a whole. As such, it is not a guarantee of the quality of every course or program offered, or the competence of individual graduates. Rather, it provides reasonable assurance about the quality of opportunities available to students who attend the institution.

Inquiries regarding the status of an institution's accreditation by the New England Association should be directed to the administrative staff of the school or college. Individuals may also contact the New England Association of Schools and Colleges, The Sanborn House, 15 High Street, Winchester, Massachusetts 01890, 617-729-6762.

Equal Opportunity Employment Policy

Northeastern University does not discriminate on the basis of race, color, religion, sex, sexual preference, age, national origin, or veteran or handi-capped status in admission to, access to, treatment in, or employment in its programs and activities. In addition, Northeastern University will not condone any form of sexual harassment. Handbooks containing the University's nondiscrimination policies and its grievance procedures are available in the Office of Affirmative Action, 175 Richards Hall. Inquiries regarding the University's nondiscrimination policies may be directed to Ellen S. Jackson, dean and director, Office of Affirmative Action, 175 Richards Hall, Northeastern University, Boston, Massachusetts 02115, 617-437-2133. Inquiries concerning the application of nondiscrimination policies may also be referred to the Regional Director, Office for Civil Rights, United States Department of Education, J.W. McCormack Building, Post Office Court House, Room 2222, Boston, Massachusetts 02109-4557.

Delivery of Services

The University assumes no liability, and hereby expressly negates the same, for failure to provide or delay in providing educational or related services or facilities or for any other failure or delay in performance arising out of or due to causes beyond the reasonable control of the University, which causes include, without limitation, power failure, fire, strikes by University employees or others, damage by the elements and acts of public authorities. The University will, however, exert reasonable efforts, when in its judgement it is appropriate to do so, to provide comparable or substantially equivalent services, facilities or performance, but its inability or failure to do so shall not subject it to liability.

The Northeastern University Bulletin contains current information regarding the University calendar, admissions, degree requirements, fees, and regulations. Such information is not intended to be and should not be relied upon as a statement of the University's contractual undertakings.

Northeastern University reserves the right in its sole judgment to promulgate and change rules and regulations and to make changes of any nature in its program, calendar, admissions policies, procedures and standards, degree requirements, fees, and academic schedule whenever it is deemed necessary or desirable, including, without limitation, changes in course content, the rescheduling of classes, cancelling of scheduled classes and other academic activities, and requiring or affording alternatives for scheduled classes or other academic activities, in any such case giving such notice as is reasonably practicable under the circumstances.

Northeastern will do its best to make available to you the finest education, the most stimulating atmosphere, and the most congenial conditions it can provide. But the quality and rate of progress of your academic career are in large measure dependent upon your own abilities, commitment, and effort. This is equally true with respect to professional advancement upon completion of the degree or program in which you are enrolled. The University cannot guarantee that you will obtain or succeed at any particular job; that will depend upon your own skills, achievement, presentation, and other factors such as market conditions at that time. Similarly, in many professions and occupations there are increasing requirements imposed by federal and state statutes and regulatory agencies for certification or entry into a particular field. These may change during the period of time when you are at Northeastern and they may vary from state to state and from country to country. While the University stands ready to help you find out about these requirements and changes, it is your responsibility to initiate the inquiry because the University has no other way of knowing what your expectations and understandings are.

In brief, the University is there to offer you educational opportunities and choices and to assist you in finding the direction in which you want to steer your educational experience, but you are a partner in this venture with an obligation and responsibility to yourself.

Emergency Closing of the University

Northeastern University has made arrangements to notify students, faculty, and staff by radio when it becomes necessary to cancel classes because of extremely inclement weather. AM radio stations WBZ (1030), WEEI (590), WHDH (850), and WRKO (680) and FM stations WBCN (104.1) and WROR (98.5) are authorized to announce the University's decision to close. Since instructional television courses originate from live or broadcast facilities at the University, neither the classes nor the courier service operate when the University is closed.

Disability Resource Center

The Disability Resource Center provides a variety of support services and general assistance to all of Northeastern's disabled students and employees. The University's efforts to comply with the Title IX Education Amendments of 1972 and section 504 of the Rehabilitation Act of 1973 are coordinated by the dean and director of Affirmative Action.

Family Educational Rights and Privacy Act

In accordance with the Family Educational Rights and Privacy Act of 1974, Northeastern University permits its students to inspect their records wherever appropriate and to challenge specific parts of them when they feel it is necessary to do so. Specific details of the law as it applies to Northeastern are printed in the Student Handbook and are distributed annually at registrations of the University College and graduate schools.

Disclaimer

Tuition rates, all fees, rules and regulations, courses and course content are subject to revision by the President and the Board of Trustees at any time.

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Graduate Schools Course Descriptions

1991–1992



Northeastern University

**Graduate Schools
Course Descriptions**

1991–1992

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Graduate School of Arts and Sciences

Anthropology and Sociology

All courses carry three quarter-hours of credit unless otherwise specified.

Social Anthropology

Many undergraduate courses in the SOA 300 and SOA 400 series may be offered for graduate credit. Students should check the current course announcements to take advantage of these offerings.

SOA 3100 Culture Theory 4 QH

Analyzes the emergence and growth of the major theoretical orientations in contemporary anthropology: functionalism, structuralism, Marxism, and post-structuralism. Examines each theory through primary sources written by anthropologists working in the various traditions. Discusses theories as they relate to the practice of anthropology and to the social context of the anthropologists' own culture.

SOA 3102 Class and State Formation 4 QH

Compares the development of social, political, and economic stratification in some societies and the maintenance of unstratified relations in others. Critically evaluates theories about why and under what conditions societies become stratified. Examines the emergence of classes and state structures in historical and contemporary cases.

SOA 3120 Camera on Culture: Visual Anthropology

Explores how cultures are portrayed on film and examines anthropologists' use of film to gather information and represent other peoples. Discusses how postcolonial societies' filmmakers have addressed their own cultures, the experience of colonialism, and the nature of filmmaking and film/video consumption in the third world. When possible, includes lab film production.

SOA 3121, SOA 3122 Fieldwork 1, 2 4 QH each

Studies data collection through participant observation and related anthropological methods. Includes data analysis and reports. Not offered in years in which SOC 3120 and SOC 3121 are offered.

SOA 3145 Peasants

Examines the institutions of peasant society. Investigates the structure of traditional civilizations and the relations between urban and local communities: comparative and functional analysis of the peasant community and the dynamics of change from peasant to postpeasant and industrialized societies.

SOA 3155 Individual and Culture

Examines current theory and method in the study of the interplay between personality and culture. Discusses contributions by various disciplines.

SOA 3156 Gender, Kinship, and Social Change 4 QH

Focuses on debates surrounding the origin of the gender division of labor and the family. Examines gender relations and kinship dynamics, including family forms in a political and economic context, using examples of egalitarian, ranked, stratified, and

state-level societies. Analyzes social stratification, colonialism, and capitalist development in relation to changing gender roles, and critically evaluates theories of the emergence of gender hierarchy.

SOA 3220 Culture and Mental Illness

Discusses and analyzes the nature and meaning of culture, the role of culture in personality formation, culture and anxiety, and anthropological approaches to the normal and the "abnormal." Explores the question, "Is mental illness psychological fact or cultural fiction?"

SOA 3310 Development and Decolonization

Examines the transformation of postcolonial societies through capitalist or socialist development and discusses theories of modernization, neocolonialism, and uneven development. Also explores the commercialization of agriculture, urbanization, labor migration, and economic stratification as these shape and are shaped by cultural factors.

SOA 3345 Urban Ethnography

Studies selected problems in anthropological studies of urban life, analyzing class and race dimensions of those who study and those who are studied through contemporary ethnographies. Compares studies of urban life in the United States and in the neocolonial world for underlying assumptions and for characterizations of kinship, economic, and political relations. Addresses the question of domestic fieldwork or studying one's own culture.

SOA 3355 Anthropology of Law and Conflict

Topics include settling disputes in stateless societies; forms and mechanisms of social control; law as an indicator of cultural and social norms; and the study of conflict resolution as an ethnographic tool. Requires some field research and analysis.

SOA 3360 Economic Anthropology

Focuses on debates about the nature of production, distribution, and exchange in precapitalist (egalitarian and peasant) societies. Analyzes transformations of indigenous property relations, savings and credit arrangements with capitalist colonialism and post-colonial development, and examines the uneven transition from subsistence to market economies.

SOA 3410, SOA 3411, SOA 3412, SOA 3413 3 QH each Contemporary Issues in Social Anthropology

Studies contemporary issues in the field of anthropology. Includes supervised readings and written reports on special programs.

SOA 3425 Tribal Societies and Culture

Examines the problems faced by today's tribal peoples and national minorities. Using cross-cultural case studies, students analyze the relationship of governmental policies and economic development priorities to the survival of self-identified tribal

cultures and minority populations throughout the world. Addresses questions of human rights, nationalism, cultural autonomy and resistance, and self-determination.

SOA 3440 Latin American Society and Development

Explores the process of social, economic, and cultural change in Latin America. Focusing on the present, traces class formation, agrarian structures, ethnic identity, ceremonial organization, gender roles, and political conflict since the colonial era in a range of Latin American countries. Stresses the relationship between communities and national, political, and economic systems. Focus over the years will alternate between Central America and Mexico and South America.

SOA 3441, SOA 3442, SOA 3443, SOA 3444, SOA 3445 Ethnographic Studies 3 QH each

These area studies courses are offered as the department's resources permit. Topics include Latin America, the Caribbean, Africa, China/East Asia, India/South Asia, Southeast Asia, the Mediterranean, and Eastern Europe.

SOA 3600, SOA 3601, SOA 3602 Seminar 3 QH each

Discusses selected topics in the field of anthropology.

SOA 3798 Master's Paper Continuation 0 QH

SOA 3800, SOA 3801, SOA 3802 3 QH each

Directed Study in Social Anthropology

Comprises reading and empirical research in social and cultural anthropology supervised by members of the anthropological staff.

SOA 3803 Directed Study in Anthropological Theory 4 QH

Studies major contemporary orientations, including evolutionary approaches, culture area, cultural ecology, functionalism, structuralism, and analysis of current status of these and other theories. *Prereq.* *Permission of Committee on Graduate Studies.*

SOA 3810 Master's Paper in Social Anthropology 3 QH

Comprises empirical or library research meeting the criteria for publication in a professional journal. Supervised by members of the department.

Sociology

Many undergraduate courses in the SOC 300 and SOC 400 series may be offered for graduate credit. Students should check the current course announcements to take advantage of these offerings.

SOC 3100 Foundations of Social Theory 1 4 QH

Studies the classic theorists including Durkheim, Weber, Marx, and others.

SOC 3101 Foundations of Social Theory 2 4 QH

Analyzes modern theorists from the 1930s onward (Parsons, Merton, Levi-Strauss, Goffman, Homans, Schutz, Garfinkel, Ricoeur, Lukacs, Habermas, and others). Stresses the social and historical context of theory construction.

SOC 3103 American Society

Studies the development of, and the changes in, the institutional structure of American society in comparison with certain other social systems.

SOC 3113 Introduction to Research Methods 2 QH

Introduces methods of social research including field study and participant observation techniques, survey techniques, interviewing and questionnaire construction, sampling procedures, experimental design, content analysis, and uses of available data. Open only to Law, Policy, and Society students.

SOC 3114 Introduction to Quantitative Research Methods 2 QH

Introduces quantitative techniques of analysis. Students are expected to conduct individual research projects. Open only to Law, Policy, and Society students. *Prereq.* *SOC 3113 or equiv.*

SOC 3115 Statistical Methods for Sociologists 4 QH

Introduces statistical methods relevant to sociology. Topics include tabular analysis, nonparametric statistics, analysis of variance, regression analysis, path analysis, measures of association, estimation, and univariate and multivariate hypothesis testing. A knowledge of elementary statistical theory is presumed.

SOC 3116 Introduction to Research Methods 4 QH

Surveys methods of social research including field study and participant observation techniques, survey techniques, interviewing and questionnaire construction, sampling procedures, experimental design, content analysis, and use of available data.

SOC 3117 Quantitative Research Methods 4 QH

Presents quantitative techniques of analysis. Students are expected to conduct individual research projects. *Prereq.* *SOC 3116 or equiv. or permission of instructor.*

SOC 3120, SOC 3121 Seminar in Qualitative Analysis 1, 2 4 QH each

Studies qualitative techniques of analysis. Examines social-structure process and meaning in interacting groups. Students study a face-to-face group by means of participant observation using symbolic interaction concepts. Not offered in years in which SOA 3121 and SOA 3122 are offered.

SOC 3125, SOC 3126, SOC 3127 Proseminar 1 QH each

Focuses on issues related to graduate student life and expectations, professional and career choices, and works in progress. Students have an opportunity to explore more informally, with each other and with various faculty members, some of the important issues in the profession. Suggested for entering students.

SOC 3135 Issues in Social Psychology

Examines human behavior and theories of self from a sociological and psychological perspective. Gives special consideration to interpersonal relations, socialization, and symbolic interaction.

SOC 3140 Sociology of Prejudice and Discrimination

Studies the characteristics, causes, and consequences of prejudice and discrimination, with particular reference to American society.

SOC 3147 Urban Sociology

Discusses theories of the development of urban life. Compares preindustrial and industrialized urban areas. Presents methods for the study of urban social structure and change, and evaluates contemporary metropolitan action programs.

SOC 3148 Boston Seminar

Studies urban development, including environmental and historical circumstances, demands for services, response to events, and programs. Examines basis for value systems of Yankees, ethnics, and cosmopolitans, the impact on downtown and neighborhood relations, and metropolitan prospects.

SOC 3149 Metropolitan and Regional Issues

Analyzes problems, policies, programs, and activities associated with metropolitan and regional life. Includes assessment of values, institutions, networks, interest groups, decision making, service delivery, growth and development, environment, equity, and integration. Presents case studies in societal context.

SOC 3155 The Family

Analyzes social structure and social functions of the family as a social institution. Includes comparative and historical examination of relations between the family and other institutions in society.

SOC 3160 Women, Men, and Social Change

The Industrial Revolution and the corresponding changes in the labor force and patterns of domestic life have altered the sexual division of labor. In post-industrial society new institutional forms are recasting personal relations. Examines these forces of social change and their impact on sex roles.

SOC 3165 Sociology of Education

Analyzes the structure and functioning of educational institutions, and presents student, faculty, and administrative perspectives. Emphasizes the role of education in processes of socialization, social mobility, social change, and social control.

SOC 3166 Sociology and Anthropology in the Schools 4 QH

For current and perspective teachers of sociology and anthropology at the precollege and community college levels. Offers participants the opportunity to analyze curricula in their fields and consider alternative rationales for various approaches to teaching sociology and anthropology at these levels. Focuses on the potential uses of sociological and anthropological concepts in analyzing and solving educational problems. Students are expected to present either a course or unit they have prepared or a project they have planned or conducted utilizing a sociological or anthropological perspective.

SOC 3170 Intergroup Relations

Examines the relations between various racial, national, cultural, and religious groups with emphasis

on historical development. Pays particular attention to American society with its specific problems of adjustment and assimilation.

SOC 3171 Race and Ethnic Relations: A World Perspective

Offers cross-cultural analysis of race and ethnic relations in Western and non-Western societies. Explains race and ethnic relations in terms of contemporary developments, world problems, and ideological conflicts.

SOC 3175 Sociology of Work

Examines what effects the social organization of work has on the lives of workers and on the structure of society.

SOC 3176 Sociology of Occupations and Professions

Studies the relations between the occupations and professions and society. Special topics may include occupational stratification, professional group behavior, recruitment and socialization of occupations and professions, and political activism.

SOC 3185 Sociology of Deviant Behavior

Applies sociological concepts and principles to some problems of social disorganization in industrial societies. Analyzes such problems as suicide, prostitution, physical handicaps, unemployment, alcoholism, sexual deviance, and gambling.

SOC 3186, SOC 3187 Social Control 1, 2 3 QH each

Presents a seminar in research, theories, and methods in the sociology of social control.

SOC 3190 Sociology of Delinquency

Analyzes social and social psychological factors of delinquency and their implications for prevention, rehabilitation, and treatment.

SOC 3200 Sociology of Alcoholism

Examines four general problem areas: the conditions under which people categorize others as alcoholics; the processes by which persons so defined are assigned deviant status and assume appropriate roles and self-images as alcoholics; the development of drinking careers and their relationship to deviant subcultures; and the social situations in which people transform their deviant identities as alcoholics. Applies organizational analysis to the development and changing network of alcoholism treatment services and tries to develop some tentative generalizations on the social organization of alcoholism.

SOC 3205 Sociology of Crime and Justice

Presents a sociological and legal analysis of the criminal justice system, concentrating on police and law enforcement; plea-bargaining; courtroom research and trial strategies; sentencing; and prisoners' rights and corrections. Considers the relationship of race, social class, and crime, as well as the sociological explanations of crime.

SOC 3206 Sociology of Law

Reviews fundamentals of law. Includes the concept of social control, order and law, consensus and conflict, analysis of the normative-formative influences of law,

mores and morals, the concept of justice, and analysis of some legal institutions.

SOC 3215 Sociology of Medicine

Studies social aspects of illness and medicine, historically and cross-culturally. Focuses on illness and the medical profession in modern society and their structural settings: the community, the hospital, the medical school. Critically examines research studies in the field and specifies problems for future research.

SOC 3225 Sociology of Aging

Examines the field of social gerontology, the nature and roots of ageism and topics such as elderly housing, life study, institutionalization, health care, retirement, leisure, and senior power.

SOC 3226 Processes of Aging

Considers socioeconomic and social psychological consequences of aging from the perspective of health-care providers. A major part of the course focuses directly on the biological changes entailed in aging and the appropriate medical management of geriatric patients. Open to students expected to provide health care services to geriatric patients.

SOC 3240 Formal Organizations: Administration and Structure

Analyzes the goals and functions of modern organizations. Examines aspects of bureaucratization within business firms, public institutions, and private associations.

SOC 3245 Sociology of Poverty

Analyzes sociological perspectives on causes of poverty, public views on poverty, and institutional responses to poverty. Emphasizes a concern with policy issues and implementation of policies. For advanced students in the social sciences and in the various human service schools in the University.

SOC 3275 Sociology of Art

1 QH

Investigates the practices which lead to the production of artistic meaning. Topics include the relationship of art to society; the nature of artistic communities, their relationship to patronage systems and art markets; and how these systems are rooted in particular social and historical contexts.

SOC 3276 Popular Culture

Both pluralist and mass culture theories are inadequate in explaining mass popular culture; therefore, a primary objective of the course is to develop and refine an efficient theoretical framework. Problems addressed include the relationship of popular culture, high culture, and folk culture and the genesis and role of the mass media in industrial societies. Students also focus on empirical research in several forms of popular culture, including sports, rock music, and science fiction novels; and examine the organization and impact of market, stylistic shifts, and the viability of criticism.

SOC 3278 Mass Communication and Society

Studies the production, consumption, and meaning of media systems and their products in advanced industrial societies. Focuses on the legitimation and

ideological function of mass media, especially its role in the reproduction and challenge of social relations. Explores the development of Western media; the economic and social organization of media institutions and its impact on media products and their use; the existence of and possibilities for alternative media; and the impact of Western media in the third world.

SOC 3286 Sociology of Science

Presents selected topics dealing with interactions between science and society.

SOC 3300 Contemporary Sociological Theories

Analyzes major contemporary theories such as functionalism, conflict, neo-Marxism, and others. *Prereq.* SOC 3100 and SOC 3101 or equiv. or permission of the instructor.

SOC 3301 Recent Developments in Sociological Theory

This course is required for students in the PhD program who seek a comprehensive treatment of current developments in sociological theory. Among the schools that might be considered are: critical theory, modern Marxist theory, contemporary French theory, semiotics, hermeneutics, symbolic interactionist theory, and other emerging schools of thought. The specific content of the course changes periodically in order to keep the focus of the course on new horizons in theory. The relation of theory to research is also a main goal of the course. Topics selected and announced by the instructor in advance. *Prereq.* SOC 3100 and SOC 3101 or equiv. or permission of instructor.

SOC 3302 Sociology of Knowledge

Explores the relationship between the social base of a society and its intellectual products. Considers the viewpoints of authors such as Marx, Weber, Mannheim, G. H. Mead, the neo-Marxians, and other modern schools. *Prereq.* SOC 3100 and SOC 3101 or equiv. or permission of instructor.

SOC 3303 Economic Sociology

Discusses the role of economic factors in the social process. Considers both classic economic theory and its impact on classic social theory, and the potential interrelations between modern economic theory (especially model-building approaches) and general sociological problems.

SOC 3304 Feminist Theory

Traces major trends in feminist theory since the rise of the contemporary women's movement. Begins with early theories, identified as Marxist-Feminist, Socialist-Feminist, and Radical-Feminist, then considers important feminist issues: the origins and universality of women's oppression, the reproduction of gender in the family (neo-Freudian feminist and anthropological approaches), women's work under capitalism, and sexuality.

SOC 3310, SOA 3311 Social and Cultural Change 1, 2

3 QH each

Analyzes the changing patterns in social, economic, and political institutions. Discusses modern social

trends. Two-quarter course in conjunction with anthropology.

SOC 3320 Multiple Regression in Sociological Analysis

Focuses on techniques of sociological analysis based on multiple regression. For example, use of coded variables, trend analysis, covariance analysis, and model testing. *Prereq.* SOC 3115 and SOC 3117 or equiv.

SOC 3321 Current Issues in Social Research

Examines selected topics in methods of social research. *Prereq.* SOC 3116 and SOC 3117 or equiv. or permission of instructor.

SOC 3322, SOC 3323 Experimental Methods 3 QH each in Social Research 1, 2

Studies experimental design and laboratory methods in sociology. The small groups laboratory is treated as a setting for testing sociological theory. Emphasizes techniques and problems in the creation and manipulation of social variables in the laboratory situation, while also considering the techniques of the natural experiment.

SOC 3325 Sociology of Policy, Planning, and Evaluation

Introduces the social, political, and economic factors affecting policy formation and the eventual success or failure of social programs in health, education, welfare, and urban planning. Stresses evaluation of policy alternatives and planning problems. For advanced students in the social sciences and in the various human service schools of the University.

SOC 3335 Seminar in Symbolic Interaction

Discusses the social psychology of groups as found in the works of Mead, Becker, Blumer, Goffman, and others.

SOC 3336, SOC 3337, SOC 3338 Seminar on Socialization 1, 2, 3 3 QH each

SOC 3336: Reviews theories and findings in organizational socialization. SOC 3337: Offers students the opportunity to design studies in organizational socialization. SOC 3338: Requires that students present results of their studies. Not open to first-year students.

SOC 3345 Community Analysis

Presents ecological theories of human relations with the physical environment. Develops the concept of, and discusses methods for, community study. Compares rural communities and urban neighborhoods. Discusses and evaluates community action programs.

SOC 3347 Seminar in Urban Social Policies 4 QH

Evaluates social science theories and methods from the perspectives of urban affairs. *Prereq.* Permission of instructor.

SOC 3355 Political Sociology

Presents sociological analysis of power relations and power systems with special attention to the bases of political power, processes of change in power, and the part played by violence and revolutionary movements.

SOC 3357 Comparative Socialism

Analyzes twentieth-century socialism from a comparative perspective. Covers the variety of "socialisms" that have developed in the Soviet bloc, China, Yugoslavia, and Cuba, as well as western social democracy (Sweden) and Eurocommunism. Topics include political structure, class relations, industrial organization, cultural formations, dynamics of change, and democratization.

SOC 3360 Social Stratification

Places theories of inequality between groups in historical perspective, from classical to modern industrial times. Discusses and evaluates sociological research in social stratification with regard to different social and cultural groups.

SOC 3365 Social Movements

Studies various movements for social change from all points of the political spectrum. Gives special attention to the structural context, as well as to such processes of social movements as social base, leadership, strategy, and organization.

SOC 3390, SOC 3391 Seminar in Social Structure 1, 2 3 QH each

Relates current theories and research in sociology, social psychology, and social anthropology.

SOC 3405 Theories of Criminology

Examines theories and philosophies underlying various correctional systems, and schools of thought in criminology and penology. Traces theoretical approaches to the crime and delinquency problem from the beginnings of criminology to current thinking.

SOC 3410, SOC 3411, SOC 3412, SOC 3413 Contemporary Issues in Sociology 3 QH each

Discusses contemporary issues in sociology. Includes supervised readings and written reports on special problems.

SOC 3430 Latin American Societies

Studies and analyzes selected Latin American societies with particular attention to such countries as Cuba, Mexico, Peru, and Brazil. Emphasizes urbanization and industrialization, and social and political change.

SOC 3431 Middle East Area Study

Presents a sociocultural analysis of the Middle East. Discusses ecological, structural, institutional, and normative factors in nomadic, rural, and urban life. Includes comparative regional analysis.

SOC 3470 Sociology of Religion

Offers a sociological analysis of religious institutions, and experiences in their historical and contemporary content. Considers religious and political context.

SOC 3485 Computers and Society

Offers a graduate seminar on the social impact of the computer "revolution" on the contemporary world. Topics include conditions of work, education, recreation, privacy, the computer science profession, paradigms of human thought, politics, and social change in the world economy.

SOC 3600, SOC 3601, SOC 3602 Seminar 3 QH each
Discusses selected topics in the field of sociology.

SOC 3603 Rhetoric in Sociology
Examines critically the conventional forms of sociological writings. Demonstrates how conventions differ by theoretical perspective and paradigm.

SOC 3615 Tutorial in Teaching 3 QH
Discusses issues and problems in teaching. This is a required course for all doctoral candidates and should be taken during a quarter when the student has major responsibility for designing and executing a course in either sociology or anthropology. Open to doctoral candidates only.

SOC 3620, SOC 3621, SOC 3622 Doctoral Proseminar 1 QH each
Designed to help socialize doctoral candidates for participation as professional sociologists and anthropologists. Topics include the nature of intellectualism and the functions of an intellectual in society today, the university as a structure and as a community of scholars, the nature of professional organizations, teaching sociology and anthropology, the organiza-

tion of sociological and anthropological research, ethics in the profession, and the nature of applied sociological and anthropological work. Offers participants the opportunity to acquire practical experience in self-presentation and giving colloquia. Required of all doctoral candidates. *Prereq.* SOC 3321 and SOC 3300 or SOC 3301 or SOC 3302 or permission of instructor.

SOC 3798 Master's Paper Continuation 0 QH

SOC 3799 Doctoral Dissertation Continuation 0 QH

SOC 3800, SOC 3801, SOC 3802 Directed Study in Sociology 3 QH each
Comprises reading and research directed by a faculty member. Open to doctoral candidates only.

SOC 3810 Master's Paper in Sociology 3 QH
Comprises empirical or library research meeting the criteria for publication in a professional journal. Supervised by members of the department.

SOC 3820 Doctoral Dissertation 0 QH

Biology

BIO 3411 Evolution 4 QH
Reviews the theories of evolution, evidence, and mechanisms of speciation. Lab consists of term paper and presentation. *Prereq.* BIO 1104 or BIO 1107 and BIO 1260.

BIO 3441 Vertebrate Zoology 4 QH
Surveys the diversity, systematics, anatomy, physiology, and ecology of all vertebrate classes of New England. Lab consists of field observations, museum trips, and specimen study. *Prereq.* BIO 1104 or BIO 1107 and BIO 1211.

BIO 3446 Ornithology 4 QH
Examines the diversity, systematics, anatomy, physiology, and ecology of the birds of the world. Lab consists of field observations and specimen study. *Prereq.* BIO 1104 or BIO 1107 and BIO 1211.

BIO 3448 Mammalogy 5 QH
Studies the diversity, systematics, anatomy, physiology, and ecology of the mammals of the world. Lab consists of field collection and specimen preparation and study. *Prereq.* BIO 1104 or BIO 1107 and BIO 1211.

BIO 3450 Immunology 4 QH
Presents an overview of the structure and function of genes, proteins, and cells involved in the generation of the immune response. Emphasizes molecular immunology and immunogenetics. *Prereq.* BIO 3564 and BIO 3565; concurrent registration in BIO 3565 acceptable.

BIO 3460 Current Topics in Cell Biology 4 QH
Explores topics of current interest in the biochemistry and molecular biology of cells. Topics may include protein synthesis and translocation; biosynthesis and

recycling of membranes; receptor structure and function; organelle structure, biosynthesis, and function; and DNA replication and macromolecular assemblies. *Prereq.* BIO 3564 and BIO 3565 or equivs.

BIO 3465 Advanced Immunology 3 QH
Presents, critically reviews, and discusses current concepts in immunological research within the context of the field of immunology.

BIO 3475 Advanced Population Biology 3 QH
Covers important developments in population biology during the past decade. Topics include the historical context of current issues, the controversy over interspecific competition, effects of predation on the ecology and evolution of populations, chaos theory and population dynamics, and the importance of spatial and temporal variation in the environment. Emphasizes theoretical models as well as field experiments and observational studies.

BIO 3501 Biological Laboratory Computing 4 QH
Introduces students to the basic techniques of interfacing biological experiments to computers, using lectures that present problems to be solved by applying contemporary microcomputing devices. Surveys the architecture of a lab computing system; discusses problems inherent in applying contemporary lab input/output devices; and provides the background in graphics and database management necessary for generating reports.

BIO 3509 Principles of Systematics 4 QH
Surveys the theories and techniques employed in plant and animal systematics and the rules according to the International Codes of Zoological and Botanical Nomenclature. *Prereq.* Permission of instructor.

BIO 3510 Environmental and Population Biology 2 QH

Examines physiochemical factors influencing and influenced by organisms. Explores interaction among individual organisms and among species. Students are expected to participate in lectures and labs given for BIO 1211, and are assigned individual work on specialized aspects of ecology. Open only to graduate students completing deficiencies in entrance requirements. *Prereq.* One year of general biology, including plant and animal biology.

BIO 3512 River Ecology Laboratory 3 QH

Comprises two four-hour sessions per week (combined lecture and lab). Covers chemical determinations, measurement of primary and secondary production, and organismal identification in flowing waters of different types.

BIO 3513 Benthic Marine Ecology: Techniques 4 QH

This advanced graduate-level course examines new research techniques for studying the ecology, behavior, and biology of marine benthic invertebrates. The focus is on a small number of field and lab techniques, rather than attempting an exhaustive survey of all the existing research methods in benthic ecology. Each lab/field exercise is conducted as a mini research project. Students discuss the philosophy of experimental design and learn research techniques, including spectrophotometric analysis of sediment nutrient content, hydrodynamical analysis of larval recruitment, quantification of invertebrate growth, current velocity measurement, and multivariate statistical analysis.

BIO 3514 Salt Marsh Ecology 3 QH

Studies the mechanisms of salt marsh formation, including major plants and the factors affecting distribution; the distribution and interaction of animals; productivity; and foodwebs and energy flow. Discusses the relationship of marsh to bay in the estuarine system, marsh pools as a sub-habitat, and the effect of people using the tidal marsh. *Prereq.* BIO 1211.

BIO 3516 Aquatic Ecology 4 QH

Studies rivers, lakes, and estuaries. Focuses on physical and chemical factors, seasonal and regional variations of these factors, interactions between these factors and the effects on the biotic community. Examines examples of current and classical ecological research in each of the three aquatic communities. *Prereq.* BIO 1211.

BIO 3517 Lake Ecology Laboratory 3 QH

Comprises two four-hour sessions per week (combined lecture and lab). Topics include chemical determinations, measurement of primary and secondary production, and organismal identification in lakes of different types.

BIO 3519 Ecology of Rocky Shores 4 QH

Examines current ecological concepts regarding rocky intertidal and subtidal communities. Covers the influence of biotic and abiotic factors on composition, distribution, and diversity of plant and animal species.

BIO 3520 Environmental Microbiology 4 QH

Studies the microbial environment and ecology of the cell. Explores interactions between microbial populations, stressing soil and freshwater associations. *Prereq.* BIO 1320 or equiv.

BIO 3521 Food Microbiology 3 QH

Investigates microbiology of food with emphasis on pathogenic types and their interactions with other groups indigenous to food. Discusses food fermentations, food processing, and environmental factors influencing growth and development of microorganisms in food. *Prereq.* BIO 1320 or equiv.

BIO 3522 Food Microbiology Laboratory 2 QH

Focuses on detection, quantification, and isolation of microorganisms and their products of significance in food with emphasis on the pathogenic types. *Prereq.* BIO 3521; may be taken concurrently.

BIO 3525 Theoretical Ecology 4 QH

Studies population and community ecology, with emphasis on mathematical modeling of ecological processes. Recognizes current ecological literature, including theory developed over the past twenty years in such areas as energetics of organism growth, population dynamics and regulation, and the organization and temporal dynamics of entire communities. Gives students the applied mathematical tools necessary to work with and understand current modeling approaches. *Prereq.* Introductory ecology or evolution, and one year of calculus.

BIO 3527 Animal Virology 3 QH

Examines physical and chemical properties of viruses, viral replication, genetics, cytopathology, and tumor viruses. Covers medical virology, including pathogenesis, clinical features, epidemiology, and immunization of the common viral diseases. *Prereq.* BIO 1320 or equiv.

BIO 3530 Molecular Marine Botany 4 QH

Examines the application of biochemical and molecular approaches to ecological, systematic, and evolutionary studies of marine algae. Explores experimental methods including isoenzyme electrophoresis and DNA restriction fragment analysis. Discusses modern concepts in population genetics and evolutionary biology. Requires research projects.

BIO 3547 Biomechanics 1, Theory 4 QH

Introduces engineering theory and techniques as applied to the disciplines of morphology, evolution, and ecology. Includes material properties, structural elements and systems, and elementary fluid dynamics. Lab emphasizes biological materials in a mechanical sense, the physical biology of flow, and an examination of the fundamental principles of physical laws that affect living organisms. *Prereq.* Permission of instructor.

BIO 3548 Biomechanics 2, Applications 4 QH

Presents a forum for research in biomechanics in which students are expected to develop and execute a research project. In addition, current areas of

biomechanical research will be reviewed and evaluated. *Prereq.* BIO 3547 and permission of instructor.

BIO 3549 Physiology and Biomechanics of Animal Activity 3 QH

Offers an integrated study of the physiological and biomechanical systems that support locomotory activity in animals. The first part is devoted to the structure and function of skeletal muscle and to respiratory and cardiovascular adaptations for activity. The remainder integrates physiological and biomechanical information related to flying, swimming, and terrestrial locomotion. *Prereq.* General physiology.

BIO 3553 General Physiology of Invertebrates 4 QH

Reviews basic animal functions as manifested among the major groups of invertebrates, with comparisons to the vertebrates, especially aquatic vertebrates. Considers the cellular and biochemical bases for the functions, their control, their adaptiveness to diverse environments, and their evolutionary implications. Topics usually include respiration, circulation, nutrition, metabolism, excretion, salt and water balance, temperature responses, biological clocks, sensory organs, and various effector organs.

BIO 3554 Comparative Vertebrate Physiology 4 QH

Considers physiological principles in the context of the phylogenetic diversity of the vertebrates, histories and environments and makes comparisons with invertebrate systems when appropriate. Topics include energetics, temperature regulation, skeletal muscle, and salt and water balance. Lab. *Prereq.* BIO 1261 or equiv.

BIO 3558 Vertebrate Endocrinology 3 QH

Studies principles of hormonal regulation of physiological processes in vertebrates, mechanisms of hormone action, and neuroendocrine relationships.

BIO 3559 Animal Nutrition 2 QH

Offers detailed consideration of organic and inorganic nutritional requirements of humans and selected animals. Covers digestion, absorption, and metabolism of nutrient materials. Examines role of vitamins, minerals, and trace elements in metabolism. Topics also include variation in nutritional needs among normal individuals and in various physiological and genetic pathologies, and evaluation of food additives and of permissible levels of toxic materials in food. *Prereq.* Basic biochemistry or permission of instructor.

BIO 3560 Genetics and Developmental Biology 2 QH

Elaborates the classic laws of heredity, including cytogenetics and chemical basis of heredity. Presents selected examples of the development of form and function. Requires that students participate in lectures and labs given for BIO 1260 and perform extra individual work. Open only to graduate students completing deficiencies in entrance requirements. *Prereq.* General biology.

BIO 3561 Cell Physiology and Biochemistry 2 QH

Examines basic chemical and physical processes of cells related to their fine structure; oxidative and intermediary metabolism, photosynthesis, and membrane phenomena; movement; and chemical and physical processes of prokaryotic and eukaryotic cells. Requires that students participate in lectures and labs given for BIO 1261 and perform extra individual work. Open only to graduate students completing deficiencies in entrance requirements. *Prereq.* General biology, college physics, and organic chemistry.

BIO 3563 General Biochemistry Laboratory 4 QH

Introduces modern research techniques used in biochemistry and molecular biology. Topics include purification and characterization of proteins, kinetic properties of enzymes, isolation of high molecular weight DNA, recombination of DNA molecules in vitro, isolation of bacterial clones containing recombinant molecules, and in vitro mutagenesis. The course includes two hours of lecture and seven hours of lab. *Prereq.* Permission of instructor.

BIO 3564 General Biochemistry 1 4 QH

Surveys biochemistry emphasizing protein structure, the nature of enzymic catalysis, bioenergetics, and the metabolism of carbohydrates, lipids, and amino acids. *Prereq.* Organic chemistry and introductory biochemistry or equiv.

BIO 3565 Molecular Biology 4 QH

Emphasizes experimental design and proof in macromolecular chemistry and genetics. Studies current theories of the detailed molecular mechanisms for the preservation, expression, and evolutionary development of biological information. Emphasizes applications to general biological and health problems. *Prereq.* BIO 3564 or equiv.

BIO 3566 General Biochemistry 3 4 QH

Emphasizes the structure and function of organelles, mechanisms of hormonal control of metabolism, and gene regulation. *Prereq.* BIO 3564 and BIO 3565 or equiv.

BIO 3573 Ocean, Coastal, and Shore Studies for Teachers 4 QH

Introduces oceanography, marine biology, and marine ecology, with an emphasis on developing simple classroom and field activities for high school curricula. Geared for high school teachers and potential teachers.

BIO 3577 Malacology 4 QH

Investigates functional morphology, embryology, systematics, and ecology of the major groups of molluscs. *Prereq.* Invertebrate zoology.

BIO 3601 Biological Electron Microscopy 4 QH

Presents techniques of electron microscopy applied to biological materials. Discusses specimen preparation, fixation, thin-sectioning, staining, operation of electron microscope, photographic, techniques, and interpretation of electron micrographs. Requires student seminars and project. *Prereq.* Permission of instructor.

BIO 3605 Developmental Neurobiology 3 QH

Provides an overview of developmental neurobiology, focusing on mechanisms for the formation and differentiation of nervous systems and nerve cells. Examines the relationship between nervous system development and behavior development. Topics include the early formation of nervous systems, pattern formation, neural movement and migration, growth and differentiation of nerve cells, formation of specific synaptic connections between cells, neural plasticity, and modification of neural organization by the environment. Topics not restricted to the embryology of any particular animal group (for example, vertebrates or invertebrates), but organized around the variety of animals and experimental preparations used to study neural development mechanisms. *Prereq.* BIO 1452 or equiv.

BIO 3607 Advanced Developmental Biology 3 QH

Studies current concepts of animal and plant development at the molecular and physiological levels. Topics include nucleic acid and protein synthesis in development, metabolic activation at fertilization, regulation of the eukaryotic genome, control of cell differentiation, and molecular communication between cells. Stresses reading and interpretation of the primary literature. Includes three hours of lecture per week.

BIO 3608 Advanced Developmental Biology Laboratory 2 QH

Analyzes the fundamental problems of development through experimental techniques. Covers the culture of vertebrate and invertebrate embryos, microsurgical analysis of morphogenesis, biochemistry of development, cell-cell interactions, and organ and tissue culture. Includes five hours of lab per week. *Prereq.* BIO 3607 or permission of instructor.

BIO 3609 Cellular Aspects of Development 3 QH

Studies animal and plant development at the cellular level. Topics include cell-cell interaction, cell surface differentiation, differential cell adhesion, genetic and epigenetic control of pattern formation, and ultra-structural aspects of fertilization and development. Stresses reading and interpretation of the primary literature. Includes three hours of lecture per week.

BIO 3610 Human Ecology 4 QH

Examines human tolerance for natural and unnatural environmental factors and man's activities affecting these factors. Studies man, food, and population dynamics.

BIO 3617 Environmental Law 2 QH

Reviews the scientific information required for implementation of the legal and political aspects of environmental management. Discusses the role of the scientist as an expert witness. Studies scientific and legal predictability. Presents analyses of suitable dynamic models and case law with the goal of improving the results of legal, political, and scientific decisions bearing upon remedial environmental management.

Prereq. Biology core and first course in physiology, such as BIO 1258 and BIO 1259.

BIO 3620 Industrial Microbiology 3 QH

Investigates microorganisms and methods employed in production of products of economic and medical importance, decomposition of wastes, and control of desirable and unwanted processes and biodeterioration. Emphasizes fermentation processes. *Prereq.* BIO 1420, equiv., or permission of instructor.

BIO 3621 Industrial Microbiology Laboratory 2 QH

Offers lab and discussion seminar sessions devoted to the study of selected commercial processes.

BIO 3640 Biological Clocks 3 QH

Examines the expression of endogenously generated 24-hour (circadian) rhythms in eukaryotic life, emphasizing theoretical foundations as well as current research strategies for understanding how biological clocks work. Presents analytic principles essential for understanding biological rhythmicity in any organism at any level of organization. Emphasizes strategies used to understand the concrete mechanisms underlying biological rhythmicity.

BIO 3652 Comparative Neurobiology 3 QH

Presents a cellular approach to structure and function of the nervous system. Topics include neuronal anatomy, cellular properties of single neurons, synaptic transmission, integration in nerve cells, nerve networks, sensory systems, motor systems, sensory-motor integration, specification of neuronal connectivity, and phylogeny of nervous systems. *Prereq.* General (animal) physiology.

BIO 3661 Human Genetics 3 QH

Applies basic genetic principles to the study of variability in humans. Focuses primarily on cytogenetics, biochemical genetics, monogenetics, and multifactorial inheritance and population genetics. Topics of special interest include sex determination and differentiation, early embryology, twinning, birth-defect etiology, prenatal diagnosis, and genetic counseling. *Prereq.* BIO 1260 or equiv.

BIO 3662 Immunochemistry 4 QH

Involves intensive discussion and application of modern immunochemical topics and lab techniques. Topics include in vitro immunization of spleen cells, preparation of monoclonal antibodies, antibody-labelling procedures, enzyme-linked immunoassays (ELISA), immunofluorescence, immunoaffinity chromatography, and immunoelectrophoresis. The course consists of two hours of lecture and six hours of lab per week in two sessions of four hours each.

BIO 3663 Molecular Biology of Viruses 4 QH

Studies the growth of selected DNA and RNA viruses. Topics will include viral transcription, replication, control of viral growth and interactions with the host cell both in lytic growth and viral oncogenesis. *Prereq.* BIO 3565 or equiv.

BIO 3665 Biochemical Adaptation 3 QH

Living systems share, at the biochemical level, common mechanisms of enzymatic catalysis, energy

transformation, storage and expression of genetic information, and development, growth, and differentiation. Despite this fundamental unity, organisms have evolved adaptive biochemical modifications that enable surviving and reproducing in diverse natural environments. This syllabus focuses on the fundamental strategies of adaptation and respiratory proteins, water-solute adaptations, and adaptations to extreme temperatures and to the deep sea. *Prereq.* BIO 3564 or permission of instructor.

BIO 3667 Biochemistry Laboratory Rotation 1 3 QH
Offers experience in biochemical research; students spend six weeks in each of two labs during the winter quarter. Required of all first-year graduate students in biochemistry, cell physiology, and molecular biology.

BIO 3668 Biochemistry Laboratory Rotation 2 3 QH
Offers a continuation of BIO 3667 during the spring quarter.

BIO 3669 Biochemistry Laboratory Rotation 3 3 QH
Offers a continuation of BIO 3668 during the summer quarter. Intended for students who have not yet chosen a lab in which to carry out thesis work.

BIO 3670 Developmental Biology of Marine Invertebrates 4 QH
Offers descriptive and experimental studies of embryonic and larval development of marine invertebrates. Lab work includes observation and experimentation using live material from a broad spectrum of invertebrate phyla. (Marine Science and Maritime Studies Center.)

BIO 3672 Ichthyology 4 QH
Studies natural history and systematics of fishes, with emphasis on marine species. (Marine Science and Maritime Studies Center.) *Prereq.* Comparative anatomy or vertebrate zoology.

BIO 3690 Seminar 1 QH
Examines various topics and recent developments in botany, biochemistry, microbiology, molecular biology, physiology, and zoology in depth. Emphasizes student presentations. To facilitate the planning of assignments, students are urged to contact the instructor during the quarter before the seminar is to be offered.

BIO 3699 Doctoral Dissertation 0 QH
Requires original research in depth, representing a significant contribution of new biological knowledge, and a written dissertation thereon, under the supervision of a graduate faculty member.

BIO 3701 (1 QH), BIO 3702 (2 QH), BIO 3703 (3 QH), BIO 3704 (4 QH) Master's Thesis
Presents research methods and their application to a specific problem, under the direction of a graduate faculty member.

BIO 3711 (1 QH), BIO 3712 (2 QH), BIO 3713 (3 QH), BIO 3714 (4 QH) Special Investigations in Biology
Involves faculty-guided studies that are not directly related to research pursued for thesis or dissertation. May take the form of a special course.

BIO 3721 (1 QH), BIO 3722 (2 QH), BIO 3723 (3 QH), BIO 3724 (4 QH) Special Topics in Biology
Offers special study of a selected topic under the direction of a faculty member, preliminary to submission and approval of MS thesis proposal or MS in literature dissertation proposal. Credits are convertible to MS thesis or MS dissertation.

BIO 3731 (1 QH), BIO 3732 (2 QH), BIO 3733 (3 QH), BIO 3734 (4 QH) Master's Literature Dissertation
Focuses on extensive research of the primary literature under direction of a graduate faculty member, leading to a comprehensive written review of a significant biological problem and an oral examination.

BIO 3741 (1 QH), BIO 3742 (2 QH), BIO 3743 (3 QH), BIO 3744 (4 QH) Doctoral Research
Presents research methods and their application to a specific problem, under the direction of a graduate faculty member.

BIO 3790 Perspectives in Biology 1 QH
Discusses current developments in one of the fields of biology. Each weekly meeting will focus on a presentation by an invited expert. In-class discussion must be supplemented by written assignments. No more than 2 QH of this course may be applied to satisfy the 4 QH seminar requirement for the MS or MSHS degree.

BIO 3798 Master's Thesis Continuation 0 QH

BIO 3799 Doctoral Dissertation Continuation 0 QH

Chemistry

All courses carry two quarter-hours of credit unless otherwise specified.

I. Introductory Courses

CHM 3231 Analytical Chemistry 1 QH
Introduces analytical chemistry to students whose background in the subject is deemed inadequate. *Prereq.* Permission of the departmental academic standing committee.

CHM 3271 Organic Chemistry 1 1 QH
Introduces organic chemistry to students whose background in the subject is deemed inadequate. *Prereq.* Permission of the departmental academic standing committee.

CHM 3272 Organic Chemistry 2 1 QH
Continues CHM 3271. *Prereq.* Permission of the departmental academic standing committee.

CHM 3273 Organic Chemistry 3 1 QH

Continues CHM 3272. *Prereq.* *Permission of the departmental academic standing committee.*

CHM 3381 Physical Chemistry 1 1 QH

Offers a beginning course in physical chemistry concentrating on chemical thermodynamics for students whose background in the subject is deemed inadequate. *Prereq.* *Permission of the departmental academic standing committee.*

CHM 3382 Physical Chemistry 2 1 QH

Continues CHM 3381. Concentrates on phase equilibria, solutions, kinetic theory of gases, and chemical kinetics. *Prereq.* *Permission of the departmental academic standing committee.*

CHM 3383 Physical Chemistry 3 1 QH

Offers a beginning course in physical chemistry, concentrating on quantum chemistry, particles and waves, and Schrodinger wave mechanics for students whose background in the subject is deemed inadequate. *Prereq.* *Permission of the departmental academic standing committee.*

CHM 3431 Instrumental Analysis 1 QH

Offers a beginning course in instrumental analysis for students whose background in the subject is deemed inadequate. *Prereq.* *Permission of the departmental academic standing committee.*

CHM 3441 Inorganic Chemistry 1 QH

Offers a beginning course in inorganic chemistry for thesis students whose background in the subject is deemed inadequate. *Prereq.* *Permission of the departmental academic standing committee.*

CHM 3461 Identification of Organic Compounds 1 QH

Offers a beginning course in the identification of organic compounds dealing with the qualitative analysis of organic compounds and mixtures, using physical methods. Designed for students whose background in the subject is deemed inadequate. *Prereq.* *Permission of the departmental academic standing committee.*

CHM 3510 Special Projects in Chemistry 4 QH

Offers lab studies for nonthesis research. *Prereq.* *Permission of the departmental academic standing committee.*

II. Required Regular Courses

CHM 3521 Analytical Separations

Studies theory and practice of fundamental analytical separation techniques. Concentrates on chromatographic processes, including gas and high-performance liquid chromatography. Explores capillary/conventional electrophoresis, supercritical fluid chromatography, chiral resolutions in GC/HPLC/HPCE, and methods development with overall validation approaches.

CHM 3522 Advanced Analytical Separations

Continues CHM 3521. *Prereq.* *CHM 3521.*

CHM 3523 Electroanalytical Chemistry 1

Examines theory, practice, instrumentation, and applications of selected electroanalytical methods of analysis. Topics will be selected from among the following methods: pH, ion selective electrodes, potentiometric titrations, voltammetry, coulometry, and conductivity measurements.

CHM 3524 Electroanalytical Chemistry 2

Offers a continuation of CHM 3523. Considers equilibrium and nonequilibrium techniques in electroanalytical chemistry. Covers electrode processes, chronopotentiometry, cyclic voltammetry, and recent advances in electroanalytical chemistry. *Prereq.* *CHM 3523.*

CHM 3525 Optical Methods of Analysis 1

Studies theory and principles of molecular absorption and emission processes, instrumentation for optical methods of analysis, and specific applications and approaches for use of optical methods. Specific topics include ultraviolet-visible, fluorescence/phosphorescence, infrared, Raman, refractometry, interferometry, polarimetry, circular dichroism, optical rotatory dispersion, light scattering for polymer analysis, optical absorption/emission detectors for HPLC, chemiluminescence, micellar enhancement in spectroscopy, and other special topics of recent development and application.

CHM 3526 Optical Methods of Analysis 2

Examines principles and applications of atomic and X-ray spectroscopies. Discusses such topics as atomic emission, atomic absorption, atomic fluorescence, X-ray fluorescence and diffraction, and photoelectron spectroscopies.

CHM 3527 Analytical and Organic Mass Spectrometry

Covers theory and practice of mass spectrometry in chemical analysis. Studies principles of formation of mass spectra of organic compounds, and modern ancillary techniques using mass spectrometric detectors. *Prereq.* *One year of organic chemistry and instrumental analysis.*

CHM 3531, CHM 3532 Topics in Analytical Chemistry 1, 2 2 QH each

Presents selected topics of current importance in analytical chemistry. *Prereq.* *Permission of instructor.*

CHM 3541 Advanced Inorganic Chemistry 1

Surveys current experimental and theoretical molecular structure techniques in detail, with emphasis on modern inorganic chemistry examples that are predominantly diamagnetic. Includes symmetry and group theoretic predictions of electronic, infrared, and Raman spectral activity. Considers the basics of NMR spectra of important inorganic nuclei (H^1 , F^{19} , B^{10} , B^{11} , P^{31} , Co^{59}) along with quadrupolar effects, the electric field gradient tensor, and heteronuclear decoupling. Provides applications of NMR spectroscopy to the temperature-dependent stereochemical nonrigidity (fluxionality) of organometallic and traditional main group nonmetal compounds.

CHM 3542 Advanced Inorganic Chemistry 2

Discusses detailed electronic theories, such as crystal and ligand field theories and the molecular orbital approach, of structure and spectra of transition metal atoms, ions, and complexes. Derives energy-level diagrams with the aid of the rotation matrix and group as well as double groups. Continues structure characterization techniques, emphasizing paramagnetic phenomena as investigated by electron spin resonance and DC magnetic susceptibility measurements. Introduces cooperative magnetic ordering phenomena (anti-, ferro-, and ferri-magnetism) and nuclear gamma resonance (Mossbauer effect) spectroscopy. *Prereq.* CHM 3541.

CHM 3543 Advanced Inorganic Chemistry 3

Examines crystal symmetry. Offers introduction to theory of solids; semiconductors and metals; non-stoichiometric compounds; and solid-state reactions. Application of molecular orbital theory. Covers determination of electron distribution in transition metal compounds, Mossbauer spectroscopy, and advanced magnetochemistry. *Prereq.* CHM 3542 and CHM 3591.

CHM 3561, CHM 3562 Advanced Organic Chemistry 1, 2 2 QH each

Surveys types of organic reactions, including stereochemistry, influence of structure and medium, mechanistic aspects, and synthetic applications. *Prereq.* One year of organic chemistry.

CHM 3563 Physical Organic Chemistry

Examines relation of experimental properties to orbital concepts, aromaticity and antiaromaticity, pericyclic reactions, and photochemistry. *Prereq.* CHM 3562 or permission of instructor.

CHM 3564 Spectrometric Identification of Organic Compounds

Studies interpretation of the ultraviolet, infrared, and nuclear magnetic resonance spectra of organic compounds. *Prereq.* One year of organic chemistry.

CHM 3581 Chemical Thermodynamics 1

Covers First Law of Thermodynamics, Thermochemistry, Second and Third Laws, free energies, and reaction and phase equilibria. *Prereq.* Permission of instructor.

CHM 3582 Chemical Thermodynamics 2

Introduces the Boltzmann distribution, partition functions and their application to thermodynamics, and phase space. Applies statistical thermodynamics to selected physical systems. *Prereq.* CHM 3581.

CHM 3583 Chemical Thermodynamics 3

Explores statistical thermodynamics applied to gases, liquids, solids, and irreversible thermodynamics. *Prereq.* CHM 3582 and CHM 3592.

CHM 3591 Introductory Quantum Chemistry 1

Introduces quantum mechanics and applications to simple systems. Topics include perturbation theory and applications, harmonic oscillator, rigid rotor and applications to microwave and infrared

spectroscopy, simple atoms. *Prereq.* One year of physical chemistry.

CHM 3592 Introductory Quantum Chemistry 2

Examines the variational method, the chemical bond, and the LCAO method. Surveys group theory and applications, molecules and Woodward-Hoffman rules. *Prereq.* CHM 3591.

CHM 3593 Introductory Quantum Chemistry 3

Surveys applications of group theory and simple approximate theories to conjugated molecules. Studies the SCF method and its application to atoms and molecules, and applications to molecular spectroscopy. *Prereq.* CHM 3592.

CHM 3594 Chemical Kinetics

Explores use of experimental data to deduce the rate law of a reaction. Covers mechanisms deduced from rate laws, and the influence of experimental error on precision of rate constants and activation energies. Examines collision- and transition-state theories of reaction rates. *Prereq.* One year of physical chemistry.

III. Advanced Courses

CHM 3641 Coordination Chemistry

Discusses solution phase properties of coordination compounds and experimental methods for the study of thermodynamics stability and kinetic liability. Topics also include kinetics and mechanism of solvent exchange and substitution reactions at transition metal centers. Investigates the classification of redox reaction mechanisms, marcus theory, and phenomenological mechanisms. *Prereq.* CHM 3543.

CHM 3642, CHM 3643, CHM 3644, CHM 3645 Special Topics in Inorganic Chemistry 1, 2, 3, 4 2 QH each

Focuses on advanced topics of importance in inorganic chemistry including advanced ligand field theory: crystal field theory of ions in weak and strong fields. Examines molecular orbital theory of transition metal complexes. Analyzes the crystal structure determination in solids: crystallography, X-ray, electron and neutron diffraction techniques applied to inorganic, bio-inorganic, and other solids. Introduces resonance spectroscopy in inorganic chemistry, including electron spin, nuclear magnetic, and nuclear quadruple resonance; and Mossbauer spectroscopy. Considers solid-state chemistry: thermal, magnetic and transport properties, phase transformations and crystal defects; surface effects, and material preparation techniques. *Prereq.* CHM 3542 and permission of instructor.

CHM 3661, CHM 3662 Organic Stereochemistry and Reaction Mechanisms 1, 2 2 QH each

Studies interrelations of the stereochemistry of organic molecules with their physical and chemical behavior. Examines conformational analysis, and the effects of spatial relationships on transition states, equilibria, and reaction rates as an introduction to the study of organic reaction mechanisms. *Prereq.* CHM 3563.

CHM 3663, CHM 3664 Organic Reaction Mechanisms and Organic Synthesis 1, 2 2 QH each

Introduces the theory and practice of organic synthesis, including mechanistic aspects as they influence synthetic design and practice. *Prereq.* CHM 3662 (may be taken concurrently).

CHM 3671, CHM 3672, CHM 3673 Special Topics in Organic Chemistry 1, 2, 3 2 QH each

Covers selected topics of current importance in organic chemistry. *Prereq.* CHM 3562 and permission of instructor.

CHM 3681, CHM 3682, CHM 3683 Special Topics in Physical Chemistry 1, 2, 3 2 QH each

Studies advanced topics of importance in physical chemistry including quantum chemistry: linear algebra and the formulation of quantum theory. Examines angular momentum, group theory, small molecules, and time-dependent theory and selected advanced topics. Explores statistical mechanics and quantum statistics. Topics also include electrons in metals, photons, and phonons; superconductivity; fluctuations, noise, and irreversible thermodynamics; transport phenomena; and phase transitions of high order. *Prereq.* Permission of instructor.

CHM 3798 Master's Thesis Continuation 0 QH**CHM 3800 Analytical Seminar** 1 QH

Focuses on oral reports by the participants on current investigations in analytical chemistry. *Prereq.* Enrollment in full-time program.

CHM 3801 Inorganic Seminar 1 QH

Focuses on oral reports by the participants on current investigations in inorganic chemistry. *Prereq.* Enrollment in full-time program.

CHM 3802 Organic Seminar 1 QH

Presents oral reports by the participants on current investigations in organic chemistry. *Prereq.* Enrollment in full-time program.

CHM 3803 Physical Chemistry 1 QH

Considers oral reports by the participants on current investigations in physical chemistry. *Prereq.* Enrollment in full-time program.

CHM 3811 (1 QH), CHM 3812 (2 QH), 6 QH**CHM 3813 (3 QH), CHM 3814 (4 QH),****CHM 3815 (5 QH), CHM 3816 (6 QH), Master's Research**

Offers the chance to conduct original research, under supervision of a faculty member, leading to a written thesis thereon or to the establishment of doctoral candidacy.

CHM 3820 Doctoral Research and Dissertation 0 QH

Offers the opportunity to complete original research in depth, representing a significant contribution of new chemical knowledge, and a written dissertation thereon, under the supervision of a faculty member. *Prereq.* Doctoral candidacy.

Economics

All courses carry three quarter-hours of credit unless otherwise specified.

ECN 3005 General Economics 0 QH

Surveys macroeconomic and microeconomic concepts, theories, and techniques for students with a limited background in economics or who need a refresher course.

ECN 3010 Introduction to Microeconomic Theory 0 QH

Covers basic microeconomic theory, including consumption, production and cost theory, market structure, and welfare economics. Designed for MA degree students who need to improve their background in micro theory. Carries no academic credit toward the MA or PhD programs.

ECN 3020 Introduction to Macroeconomic Theory 0 QH

Covers basic Keynesian macroeconomic theory, emphasizing analytical concepts and tools, with some application to macroeconomic problems and public policy. Designed for MA degree students who need to improve their background in macro theory. Carries no academic credit toward the MA or PhD programs.

ECN 3030 Introduction to Mathematics for Economists 0 QH

Acquaints students with the matrix algebra and elementary calculus necessary for quantitative

economics: simultaneous linear systems; polynomial, logarithmic, and exponential functions; and elementary differential and integral calculus. Designed for MA students who need to improve their background in mathematics. Carries no credit toward the MA or PhD degrees.

ECN 3040 Introduction to Statistics 0 QH

Introduces statistical methods and techniques used in economic analysis. Studies descriptive statistics, time-series and index number problems, sampling problems, probability theory, and hypothesis testing. Designed for MA degree students who need to improve their background in basic statistics. Carries no academic credit toward the MA or PhD programs.

ECN 3110 Introduction to Microeconomic Theory for Master of Science Students 4 QH

Covers basic microeconomic theory, including consumption, production and cost theory, market structure and welfare economics. This course is equivalent to ECN 3010.

ECN 3120 Introduction to Macroeconomic Theory for Master of Science Students 4 QH

Covers basic macroeconomic theory with an emphasis on analytical concepts and tools with some application to macroeconomic problems and public policy. This course is equivalent to ECN 3020.

ECN 3130 Introduction to Mathematics for Economists for Master of Science Students

Seeks to acquaint the student with the algebra and elementary calculus necessary for quantitative economics: simultaneous linear systems; polynomial, logarithmic and exponential functions; and elementary differential and integral calculus. This course is equivalent to ECN 3030.

ECN 3140 Introduction to Statistics for Master of Science Students 4 QH

Introduces statistical methods and techniques used in economic analysis. Topics include descriptive statistics, time-series and index number problems, sampling problems, probability theory, and hypothesis testing. This course is equivalent to ECN 3040.

ECN 3150 Microeconomic Policy Planning Seminar 4 QH

Explores cost efficiency and effectiveness, assessment of externalities, shadow prices, benefit-cost analysis, project implementation and evaluation. Discusses budget analysis, evaluation of public programs, role of private and public sectors, relationship of projects and macro planning, and the use of analysis by policymakers. *Prereq.* ECN 3110, ECN 3140 *corequisite.*

ECN 3151 Macroeconomic Policy Planning Seminar 4 QH

Examines the role of public sector in the economy. Investigates socio-economic objectives and public policies, and national economic planning and synthesis of models for growth and development. Presents the tools and techniques for economic planning, and reviews the construction and utilization of input-output tables. Describes planning and policy implementation and evaluation. *Prereq.* ECN 3120, ECN 3140 *corequisite.*

ECN 3152 Workshop in Economic Planning and Policy

Includes empirical work involving micro and macro planning techniques, applying the latter to individual case studies of a specific plan, program, or organization. Students are expected to prepare and present a research paper on a chosen case study, demonstrating the ability to use planning techniques. *Prereq.* ECN 3150 and ECN 3151.

ECN 3210 Microeconomic Theory I 4 QH

Presents microeconomic theory at the MA level. Investigates equilibrium conditions in consumption and production and the theory of factor markets and efficiency. Various types of market structures are covered with respect to these areas. *Prereq.* ECN 3030 or ECN 3130.

ECN 3220 Macroeconomic Theory I 4 QH

Examines basic macroeconomic modeling and policy effectiveness. Focuses on the theoretical debate on price level and output determination from the monetarist,

Keynesian, and rational expectations viewpoints. *Prereq.* ECN 3030 or ECN 3130.

ECN 3230 History of Economic Thought

Discusses the development of economic thought, focusing on the analytical innovations in economic thought, beginning with the physiocrats and extending up to contemporary thinkers. Stresses the persistence of certain topics, like money, capital accumulation, macroeconomic stability and value theory, throughout the development of economic thought and considers the historical policy issues that inspired different thinkers to address these topics in a new way.

ECN 3240 Statistical Inference 4 QH

Studies statistical methods and techniques. Topics include probability theory and models, testing economic hypotheses, analysis of variance, estimation, non-parametric tests, t-statistics and f-statistics, and correlation analysis. *Prereq.* ECN 3040 or ECN 3140 or *statistics examination.*

ECN 3241 Econometrics I 4 QH

Studies the classical linear model of estimation, testing, and prediction. Explores the implications and solutions of multicollinearity, heteroscedasticity, and autocorrelation. Topics include qualitative variables, discrete dependent variables, dynamic models, simultaneous equation systems, instrumental variables estimation, and model selection. *Prereq.* ECN 3030, ECN 3130, and ECN 3240.

ECN 3310 Case Studies in Applied Microeconomics

Explores applied microeconomics using case studies in organizational decision-making for such problems as short- and long-run forecasting of demand, and short- and long-run cost and production decisions. Other case studies focus on competition and pricing strategies in different markets, financing of investments, and response to government regulations and taxation. *Prereq.* ECN 3010 or ECN 3110, ECN 3030 or ECN 3130.

ECN 3315 Economics of Law and Public Policy

Builds on a knowledge of intermediate microeconomic theory in evaluating the justification for an impact of various bodies of law and public policy. While the particular examples and focuses may vary, the emphasis of the course will be on economic justifications for government intervention; public policy alternatives; and impact evaluation of alternative government policies. Discussions will rely on economic models of behavior and social welfare theory to describe and predict the impact of law/regulation/policy and to evaluate alternative forms of intervention. Topics include the elements of an economic perspective, unregulated market behavior, market failure and public intervention, policy and program evaluation, and the economics of contract and tort law. Limited to Law, Policy, and Society students, with exceptions by permission of the instructor. *Prereq.* ECN 3010 or *permission of instructor.*

ECN 3330 Economic Programming

Examines economic programming with an emphasis on linear programming, simulation, and queuing theory with computer applications. *Prereq.* ECN 3530.

ECN 3332 Computers in Economic Research

Introduces the use of computers in economic research. Topics include using the Northeastern computer system, descriptive statistics, regression analysis, matrix manipulation, and high-level programming languages. This course will combine classroom lectures with hands-on use of the computer. *Prereq.* ECN 3040, ECN 3140, or ECN 3240.

ECN 3350 Economics of the Labor Market and Labor Force 1

Presents labor force measurement and determinants, participation and composition, and microanalysis of labor supply and demand. Topics also include varieties of labor markets and their functioning, labor allocation and migration, minimum wages, and applications of human capital theory to the labor force. *Prereq.* ECN 3010 or ECN 3110.

ECN 3351 Economics of the Labor Market and Labor Force 2

Studies macro money-wage and employment determination in the short run, the Phillips curve, and macro wage-price problems. Discusses income policies, unemployment and underemployment, technological change, and changing skill requirements. Includes productivity measures, determinants and trends, and secular changes in real wages and employment. *Prereq.* ECN 3020 or ECN 3120.

ECN 3352 Economics of Manpower Planning 1

Examines the role of manpower planning and its integration with general development planning. Analyzes and evaluates different techniques of manpower planning, including technological versus economic methods. Offers practice in manpower forecasting and data problems, and skill training versus educational strategies. Explores models of educational planning and their applications to different countries. *Prereq.* ECN 3010 or ECN 3110.

ECN 3353 Economics of Manpower Planning 2

Presents applications of workforce planning methods and techniques to problems of national economic development. Considers cost-benefit and cost-effectiveness of educational and manpower programs. Focuses on the special problems of health manpower, scientists, engineers, and technicians. Evaluates methods and predictions used in national workforce plans. *Prereq.* ECN 3352.

ECN 3354 Economics of Medical Care

Discusses the organization of medical care, the problems associated with various alternative delivery systems, and the utilization and availability of physicians and other paramedical personnel. Examines the growth and pressures exerted by third-party payers; considers federal, state, and municipal participation in the delivery of quality medical care under various alternatives for national health insurance.

ECN 3355 Economics of Human Capital

Examines the investments in human capital as applied to education, training, health, migration, family formation, and fertility. Uses empirical studies to illustrate human capital theory and to evaluate its usefulness in developed and developing economies.

ECN 3356 Local Labor Markets: Research Methods, Problems, and Planning

Studies analytical frameworks and empirical measures for determining the nature and operation of state and local labor markets. Analyzes techniques for planning human resource programs at state and local levels. Discusses a variety of local labor markets, the use of data from public agencies to examine such markets, and composition of local labor force. Topics also include sources of local labor supply, industrial and occupational mix, local wage and salary structures, and local income distribution.

ECN 3359 Seminar in Human Resource Development

Presents selected topics on the development and use of human resources. *Prereq.* Permission of instructor.

ECN 3360 Regional Economics

Explores determinants of homogeneous regions, including theories of location for firms, industries, and people. Considers regional income accounting systems, and models of intra- and interregional income and output; economic impact analysis. *Prereq.* ECN 3010 or ECN 3110.

ECN 3362 Economics of Crime

Discusses the resource allocation problem as it relates to criminal behavior and effective law enforcement. Evaluates costs and benefits of alternative law enforcement policies. Analyzes criminal activity, including organized crime in an economic context.

ECN 3363 Urban Economic Systems

Considers the economy of cities. Analyzes intrametropolitan spatial relationships including industrial location, and models of residential land, and housing markets. *Prereq.* ECN 3010 or ECN 3110 and ECN 3030 or ECN 3130.

ECN 3364 Urban Economic Development

Investigates problems in urban economic development. Topics include: dynamic and structural change in urban economics, models and techniques for describing and evaluating urban economies, development strategies and tools, commercial and industrial development, and housing development. *Prereq.* ECN 3010 or ECN 3110.

ECN 3366 Economics of Transportation

Provides an application of microeconomic theory to transportation. Topics include: demand and demand estimation, cost and cost estimation, pricing and investment, and regulation and deregulation. Applications cover both urban and intercity passenger transportation as well as freight transportation. *Prereq.* ECN 3010 or ECN 3110 and ECN 3030 or ECN 3130.

ECN 3369 Urban/Regional Economics Seminar

Covers selected topics in urban/regional economics. *Prereq.* ECN 3363 or ECN 3364.

ECN 3370 Economic Development Theory

Presents alternative approaches to the theory of economic development. Considers theories that address growth, technology, structural change, industrialization, factor proportions and factor prices, trade, population, and income distribution. *Prereq.* ECN 3010 or ECN 3110, ECN 3020 or ECN 3120 or permission of instructor.

ECN 3371 Regional Development

Examines methodology and applications of input-output techniques for planning and analysis in developing countries. Discusses national and multiregional input-output systems. *Prereq.* ECN 3332 or permission of instructor.

ECN 3372 Comparative Economic Development

Explores methods and applications of comparative development study, measures and indicators of development, cross-country data analysis, comparative development systems plans vs. markets, and comparative development strategies. *Prereq.* ECN 3370 or permission of instructor.

ECN 3373 Development Finance

Examines sources of investment finance in developing countries; role of taxation and tax structure reform; development of financial institutions and capital markets; private and official finance from abroad and debt-service problems; and problems of monetary management and export instability.

ECN 3374 Comparative Economic and Business Practices in the United States and Abroad

Covers market structure and business organization, ownership, management and control in the United States, OECD, and other developed countries; the influence of multinational enterprises. Studies labor markets and survey and case studies of industrial relations. Traces patterns and impact of government policies and national trade and finance patterns, volume, and practices.

ECN 3379 Development Planning Seminar

Analyzes political and economic plans. Surveys neo-classical growth economies, and input-output techniques in open and closed models. Covers elements of linear programming; optimal decision techniques; processes of implementation of planning; interaction of public and private sectors; and guide to empirical applications. *Prereq.* ECN 3020 or ECN 3120 or ECN 3220 and ECN 3370 or permission of instructor.

ECN 3380 Monetary Theory

Studies the relationships between money and economic activity emphasizing various quantity theory models and theories of the demand for money and velocity. *Prereq.* ECN 3020 or ECN 3120.

ECN 3381 Monetary Policy

Analyzes monetary policy in the United States. Studies Federal Reserve objectives, policy instruments and techniques and their relationship to aggregate

economic activity and financial markets. Introduces recent developments and issues. *Prereq.* ECN 3880.

ECN 3384 Capital Markets

Covers primary sources of savings and demand for financial assets; role of financial intermediaries; banking system; and government lending agencies. Explores demand for funds and real investment—mortgage, corporate, and government securities markets; interdependence of rate structures; and flow-of-funds data in relation to national income accounts.

ECN 3389 Seminar in Money and Finance

Selected topics in money, credit and banking. Students will write research papers. *Prereq.* Permission of instructor.

ECN 3390 Public Finance Theory 1: Public Expenditures

Surveys fiscal functions and institutions of government; public choice and fiscal politics; theory of public goods; public expenditure analysis and evaluation; and fiscal federalism and relationships among governments at different levels, including intergovernmental grants. *Prereq.* ECN 3010 or ECN 3110 and ECN 3030 or ECN 3130.

ECN 3391 Public Finance Theory 2: Taxation

Focuses on fiscal functions of government; principles of taxation; problems of tax structure and reform at the national and local levels; tax incidence and equity; effects of taxation on economic efficiency and growth; and issues of public debt and the deficit. *Prereq.* ECN 3010 or ECN 3110.

ECN 3392 Public Policy and Finance

Studies techniques of fiscal policy, fiscal policy norms, and public sector debt; tax policy and federal tax reform; the conflict between social implications of price stabilization and full employment; public expenditure policy; and the interrelation between monetary and fiscal controls. *Prereq.* ECN 3020 or ECN 3120.

ECN 3399 Seminar in Public Finance

Presents selected topics in public finance. *Prereq.* ECN 3390 and ECN 3391 or permission of instructor.

ECN 3400 International Finance

Studies international finance, international monetary agreements, and open-economy macroeconomics. Topics include foreign exchange markets, balance of payments, theory of efficient markets, exchange rate determination theories, efficiency of foreign exchange markets, news, noise traders and volatility of exchange rates, international capital movements, the international and European monetary systems, and the European Monetary Union. *Prereq.* ECN 3020 or ECN 3120.

ECN 3401 International Trade

Examines models of trade, international comparative advantage, Heckscher-Ohlin theory, protectionism and tariffs, customs union theory, trade and economic growth, uncertainty in trade models, natural resources, increasing returns, monopolistic

competition, industrial organization, and trade policies. *Prereq.* ECN 3010 or ECN 3110.

ECN 3510 Microeconomic Theory 2 4 QH

Examines advanced topics in microeconomics related to consumption, production, and market imperfections. Analyzes theory of general equilibrium, welfare economics, second best, externalities, and public goods. *Prereq.* ECN 3210 or *equiv.*

ECN 3520 Macroeconomic Theory 2 4 QH

Studies theory and problems of macro-dynamics, growth, inflation, cycles, and stabilization policy. *Prereq.* ECN 3220 or *equiv.*

ECN 3530 Mathematics for Economics 4 QH

Applies matrix algebra and simple multivariate calculus to economic analysis. Discusses static optimization and dynamic analysis; difference and differential equations. Uses examples from economic theory. *Prereq.* ECN 3030 or ECN 3130 or *mathematics examination.*

ECN 3540 Econometrics 2 4 QH

Examines asymptotic and small sample properties of various estimators; rank-order conditions for identification; specification error and error in variables; remedies for autocorrelation and multicollinearity; dummy variables; distributed lags; forecasting and simulation; non-linear estimation; and alternative estimation technique. *Prereq.* ECN 3241.

ECN 3601 Doctoral Research Seminar 1 4 QH

The PhD seminars are taken after all required PhD courses have been completed. *Prereq.* ECN 3510, ECN 3520, ECN 3530, ECN 3540 (the PhD core), and 12 QH of graduate coursework in the student's field of concentration, or by written permission of instructor.

ECN 3602 Doctoral Research Seminar 2 4 QH

Prereq. ECN 3601.

ECN 3798 Master's Thesis Continuation 0 QH

ECN 3799 Doctoral Dissertation Continuation 0 QH

ECN 3850 Internship in Economics 1 QH

Comprises academic credit for internship work in economics. For MA or MS students only. *Prereq.* *Permission of instructor and approval of graduate director.*

ECN 3851 Internship in Economics 2 QH

Comprises academic credit for internship work in economics. For MA or MS students only. *Prereq.* *Permission of instructor and approval of graduate director.*

ECN 3852 Internship in Economics 3 QH

Comprises academic credit for internship work in economics. For MA or MS students only. *Prereq.* *Permission of instructor and approval of graduate director.*

ECN 3855 Internship in Economics 1 QH

Comprises academic credit for internship work in economics. For PhD students only. *Prereq.* *Permission of instructor and approval of graduate director.*

ECN 3856 Internship in Economics 2 QH

Same as ECN 3855.

ECN 3857 Internship in Economics 3 QH

Same as ECN 3855.

ECN 3870 Readings in Economics 1 QH

Offers supervised reading in selected topics in economics. For MA or MS students only. *Prereq.* *Permission of instructor and approval of graduate director.*

ECN 3871 Readings in Economics 2 QH

Offers supervised reading in selected topics in economics. For MA or MS students only. *Prereq.* *Permission of instructor and approval of graduate director.*

ECN 3872 Readings in Economics 3 QH

Offers supervised reading in selected topics in economics. For MA or MS students only. *Prereq.* *Permission of instructor and approval of graduate director.*

ECN 3873 Readings in Economics 4 QH

Offers supervised reading in selected topics in economics. For MA or MS students only. *Prereq.* *Permission of instructor and approval of graduate director.*

ECN 3874 Readings in Economics 5 QH

Offers supervised reading in selected topics in economics. For MA or MS students only. *Prereq.* *Permission of instructor and approval of graduate director.*

ECN 3875 Readings in Economics 6 QH

Offers supervised reading in selected topics in economics. For MA or MS students only. *Prereq.* *Permission of instructor and approval of graduate director.*

ECN 3880 Readings in Economics 1 QH

Offers supervised reading in selected topics in economics. For PhD students only. *Prereq.* *Permission of instructor and approval of graduate director.*

ECN 3881 Readings in Economics 2 QH

Offers supervised reading in selected topics in economics. For PhD students only. *Prereq.* *Permission of instructor and approval of graduate director.*

ECN 3882 Readings in Economics 3 QH

Offers supervised reading in selected topics in economics. For PhD students only. *Prereq.* *Permission of instructor and approval of graduate director.*

ECN 3883 Readings in Economics 4 QH

Offers supervised reading in selected topics in economics. For PhD students only. *Prereq.* *Permission of instructor and approval of graduate director.*

ECN 3884 Readings in Economics 5 QH

Offers supervised reading in selected topics in economics. For PhD students only. *Prereq.* *Permission of instructor and approval of graduate director.*

ECN 3885 Readings in Economics**6 QH**

Offers supervised reading in selected topics in economics. For PhD students only. *Prereq.* *Permission of instructor and approval of graduate director.*

ECN 3890 Master's Thesis**6 QH**

Provides thesis supervision by members of the department. *Prereq.* *Approval of graduate director.*

ECN 3899 Doctoral Dissertation**0 QH**

Prereq. *Approval of graduate director.*

English

Students in graduate programs other than English and Curriculum and Instruction may register for English department courses only in the first week of classes and only with the permission of the instructor.

All courses carry three quarter-hours of credit unless otherwise specified.

ENG 3300 Introduction to Critical Issues

Presents approaches to the study of literature considering both traditional and contemporary views.

ENG 3302 Bibliography and Research Methods

Investigates the methods of finding information in the study of literature and language. Explores primary bibliography, secondary bibliography, and textual and critical bibliography. Examines how to research, write, and document papers for graduate seminars, how to research and write theses and dissertations, and how to publish articles and books. This course is strongly recommended for all students who plan to study for a PhD in English.

American Literature

ENG 3324 Perspectives on American Literature

Attempts to discover common themes and recurrent patterns in American literature through a close reading of critics as various in their approaches as Lawrence, Parrington, Chase, Pearce, and Fiedler.

ENG 3325 Topics in Early American Literature

Focuses on the work of one writer, a group of writers, or a theme or structure common to several writers—Jonathan Edwards, women writers, the poets of the seventeenth and eighteenth centuries, or typology, for example—in the first two hundred years of American literature. Topics change with time and demand.

ENG 3326 Topics in Twentieth-Century American Literature

Explores twentieth-century American literature on a thematic, formal, generic, cultural, or interdisciplinary basis. May include topics such as heroes and antiheroes in modern American fiction, twentieth-century American nature poetry, action painting and the New York School, women in twentieth-century American literature, surrealism in modern and contemporary American poetry, the city in twentieth-century American literature, and naturalism in the modern American novel.

ENG 3327 Major American Novelist

Examines in detail the work of a major American novelist and its historical context and cultural milieu—the work, for example, of Herman Melville, Mark Twain, Henry James, Willa Cather, Ernest Hemingway, or Saul Bellow.

ENG 3328 Major American Playwright

Examines in detail the work of a major American playwright and its theatrical style and social impact—the work, for example, of Eugene O'Neill, Tennessee Williams, Arthur Miller, or Edward Albee.

ENG 3329 Major American Poet

Considers in depth the work of a single major figure. Some likely subjects are Whitman, Dickinson, Frost, Eliot, Pound, Williams, Stevens, and Lowell.

ENG 3330 American Drama

Surveys American drama from its political beginnings in the eighteenth century to the experimental variety of the twentieth, from Royall Tyler and William Dunlap to Eugene O'Neill and Imamu Amiri Baraka.

ENG 3331 Topics in American Literature

Presents American literature on a thematic, formal, generic, cultural, or interdisciplinary basis. May include: the *Isolato* in American literature, typology and American art, written women and women writers, realism in American literature, Southern literature, humor in American literature, the frontier in American writing, local colorists, and "The Machine in the Garden."

ENG 3332 African-American Poetry

Covers twentieth-century African-American poets from the Harlem renaissance to the present. Looks at the establishment of a modern poetic tradition and an African-American aesthetic.

ENG 3333 Major Figure in African-American Literature

Examines in detail the work of a major African-American novelist, poet, or dramatist; the existing criticism; and the work's historical context and cultural milieu. Considers such authors as Richard Wright, Toni Morrison, Langston Hughes, Zora Neale Hurston, Imamu Amiri Baraka, August Wilson, Lorraine Hansberry, and Alice Walker.

ENG 3334 African-American Novel

Studies the works of a major nineteenth- or twentieth-century African-American novelist. Considers such authors as Frances Harper, Charles Chestnutt, Zora Neale Hurston, Nella Larsen, Toni Morrison, Ralph Ellison, James Baldwin, and Ishmael Reed.

ENG 3335 African-American Literature

Focuses on the development of the tradition, critical paradigms, recurrent themes, and patterns of African-American literature through close readings of selected texts and critics. Considers writers such as Houston Baker, Jr., Henry Louis Gates, Jr., Frederick Douglass, Harriet Jacobs, William S. Braithwaite, Larry Neal, Ralph Ellison, and Richard Wright.

ENG 3547 Topics in African-American Literature

Considers topics in African-American literature such as women writers, the Harlem renaissance, and autobiographies.

ENG 3583 Early American Literature

Surveys American literature during its first two centuries, from the Puritans to the Knickerbockers, from William Bradford to James Fenimore Cooper.

ENG 3585 Topics in Nineteenth-Century American Literature

Topic to be announced. Recent examples include Transcendentalism, the literature of the Civil War, and the literature of social reform.

ENG 3586 Nineteenth-Century American Prose, 1820–1865

Focuses on the characteristics of the Romantic movement and New England Transcendentalism as we find them in the works of the principal prose writers of the period. Determines the particular themes and techniques of such writers as Poe, Hawthorne, Melville, Emerson, and Thoreau by close readings of their texts.

ENG 3587 Nineteenth-Century American Poetry

Topic to be announced.

ENG 3589 Nineteenth-Century American Prose, 1865–1900

Covers the post-Civil War novel in America, including the realistic and naturalistic movements, and such authors as Twain, Howells, and Henry James. Includes some notable nonfiction writers, such as Henry Adams and William James.

ENG 3592 Modern American Drama

Analyzes philosophic and aesthetic trends among such playwrights as O'Neill, Williams, Miller, Albee, and Simon.

ENG 3593 Individual Modern American Poet

Topic to be announced.

ENG 3594 Contemporary American Prose

Concentrates on the novel in exploring developments in American prose since 1945. Considers Mailer, Bellow, Malamud, Barth, Heller, Walker, Pynchon, Vonnegut, and Hawkes.

ENG 3595 Individual Modern American Novelist

Examines in depth the work of a major figure in American fiction, focusing on the cultural context out of which he or she emerges. Recent selections for this course have been Hemingway, Fitzgerald, Mailer, Faulkner, and Bellow.

ENG 3596 Individual American Writer

Topic to be announced.

ENG 3598 Modern American Prose

Includes close examination of such prose forms as the essay, short story, autobiography, biography, history, and novel. May select writers with some special purpose in view, but those generally representative of the 1912–1950 period.

ENG 3610 Contemporary American Fiction

Surveys major developments in American fiction of the period from roughly 1945 to the present against the cultural background of that period. Considers such categories as southern fiction, Jewish fiction, black fiction, women's fiction, and such writers as Mailer, Kerouac, Welty, Malamud, and Didion.

British Literature**ENG 3416 Twentieth-Century British Drama**

Explores the evolution of British drama from Shaw to Tom Stoppard, giving particular attention to the influence of Ibsen and later European dramatists; the Irish influence of Yeats, Synge, and O'Casey; the traumas of two world wars; and the steady growth in the variety and power of British dramatic productions. Also studies Arthur Wing Pinero, John Galsworthy, D. H. Lawrence, Samuel Beckett, James Osbourne, Terrence Rattigan, and Harold Pinter.

ENG 3548 Topics in Renaissance Literature

Considers specific topics in the literature of the sixteenth century, such as the sonnet sequence, and fictional and nonfictional prose.

ENG 3549 Topics in Seventeenth-Century Literature

Considers specific topics in literature from 1600 to approximately 1660, such as metaphysical poetry, religious poetry and prose, and drama.

ENG 3551 Chaucer

Examines in detail selected works by Chaucer.

ENG 3553 Medieval Literature

Examines in detail major works of medieval literature.

ENG 3554 Topics in Medieval Literature

Topic to be announced.

ENG 3555 Renaissance Literature

Studies non-dramatic works by such authors as Wyatt and Surrey, Sidney, Marlowe, Spenser, and Shakespeare.

ENG 3558 Shakespeare's Tragedies

Studies Shakespeare's major tragedies.

ENG 3559 Shakespeare's Comedies

Studies Shakespeare's major comedies.

ENG 3560 Topics in Shakespeare

Topic to be announced.

ENG 3561 Seventeenth-Century Literature

Covers major prose and poetry of the seventeenth century, excluding drama: Bacon, Hobbes, Browne, Bunyan, Donne, Herbert, Johnson, Marvell, and others.

ENG 3562 Milton

Presents Milton's poetic and intellectual achievement through analysis of his major works. Emphasizes *Paradise Lost* as an expression of Renaissance humanism and the culmination to the epic tradition.

ENG 3563 Restoration and Early Eighteenth-Century Literature

Critically studies neoclassical drama, poetry, and criticism, including Restoration drama, Dryden, Pope, Addison, Steele, and Gay.

ENG 3564 Later Eighteenth-Century Literature

Considers Johnson, Boswell, and the Club: Burke, Goldsmith, and Gibbon. Includes poetry of Cowper, Gray, Burns, and Smart.

ENG 3565 Topics in Eighteenth-Century Literature

Topic to be announced.

ENG 3566 Eighteenth-Century Novel

Focuses on novels by Defoe, Fielding, Richardson, Smollett, Sterne, and Austen.

ENG 3568 Romantic Poetry

Surveys representative forms and works of the major poets of the English Romantic Period (1798-1832): Blake, Wordsworth, Coleridge, Byron, Shelley, and Keats. Studies the poetry in the historical and intellectual context of its time.

ENG 3569 Romantic Literature

Surveys representative forms and work of English Romantic prose—both fiction and nonfiction. Draws examples from the fiction of Austen, Hogg, Scott, and the Gothic novelists, as well as from the nonfiction prose of Coleridge, De Quincey, Hazlitt, Lamb, and Shelley. May use other texts as needed to illustrate or amplify the ideas expressed in the prose.

ENG 3570 Topics in Romanticism

Explores Romantic attitudes toward humankind in relation to self, society, and the universe, and Romantic attitudes toward the individual person as poet, with the impact these attitudes have upon the form and thematic substance of authentic and fictional autobiography in poetry and prose. May include an intensive reading of one major British writer whose attitudes, themes, style, and philosophy are representative of the Romantic Era (1798–1832).

ENG 3571 Victorian Literature

Surveys major genres in Victorian literature with emphasis on the transition from the Victorian to the "modern," including such writers as Carlyle, Ruskin, Arnold, Swinburne, Pater, and Wilde.

ENG 3572 Victorian Poetry

Focuses on Tennyson, Browning, Arnold, the pre-Raphaelite circle, and the movement toward modernism: D. G. Rossetti, A. C. Swinburne, G. M. Hopkins.

ENG 3573 Victorian Novel

Closely studies major works by such writers as Dickens, Eliot, the Brontës, and Hardy.

ENG 3575 Topics in Victorian Literature

Topic to be announced.

ENG 3580 Twentieth-Century British Fiction

Examines major figures of the modern and the contemporary periods: Conrad, Joyce, Cary, Beckett, Braine, Fowles, Snow, Lawrence, Woolf, Murdoch, Lessing and Huxley.

ENG 3582 Topics in Irish Literature

Examines such topics as the Irish renaissance, Irish short fiction, and the Irish novel.

ENG 3628 Topics in Twentieth-Century British Literature

Explores various topics in twentieth-century British literature.

Creative Writing

ENG 3347 Creative Writing Workshop

Comprises advanced work in creative writing.

Prereq. ENG 3350, ENG 3351 or permission of instructor.

ENG 3350 Creative Writing 1

Focuses on prose fiction.

ENG 3351 Creative Writing 2

Focuses on poetry.

ENG 3605 Independent Study in Creative Writing

By arrangement.

ENG 3606 Creative Writing Thesis

By arrangement.

6 QH

Criticism

ENG 3315 Contemporary Critical Theory

Introduces the study of modern and contemporary literary theory and criticism, including "New Critical," Marxist, feminist, psychoanalytic, structuralist, poststructuralist, phenomenological, and other approaches.

ENG 3317 Topics in Criticism

Examines such topics in critical theory as narrative, cultural criticism, representation, reader response, and feminist theory.

ENG 3320 History of Criticism

Studies the history of literary criticism from Aristotle to the present including such writers as Aristotle, Plato, Sidney, Johnson, Wordsworth, Shelley, and Pater.

Film Studies

ENG 3612 Film Studies

Introduces the basic methods of film analysis, the history of cinema, and recent theoretical debates within film studies. Provides familiarity with ways of analyzing films in terms of editing, shot composition, framing, mise-en-scene, and the like, with the historical changes in Hollywood and in international cinema, and with such current theories as structuralism and semiotics.

ENG 3613 Topics in Film

Focuses on some specific dimension of film studies—a genre of film such as film noir, a director like Alfred

Hitchcock or Francis Ford Coppola, a film movement like Expressionism or social realism, or a particular historical moment in film history such as post-1967 Hollywood. Topics chosen determine texts and films.

Independent Studies

ENG 3601 Thesis

6 QH

ENG 3602 Independent Study

By arrangement.

ENG 3603 Independent Study Certificate of Advanced Graduate Study

By arrangement. Limited to students in the Certificate of Advanced Graduate Study Program.

ENG 3798 Master's Continuation

0 QH

Linguistics

ENG 3321 Linguistics and Literature

Introduces stylistics, the study of formal properties of poetry and prose. Considers general questions: Are there constraints on creativity? What relationship holds between form and meaning? What is the nature of metaphor? How can we characterize author style, genre style? Analyzes texts of representative major writers for linguistic features. Focuses on how linguistic methods can contribute to critical response.

ENG 3322 Linguistics and Writing

Explores topics in textuality and text cohesion, distinguishing unified text from a string of unrelated sentences. Studies lexical, semantic, and syntactic cohesion, paragraph patterning, and information flow. Analyzes diverse non-fictional prose selections for discourse style features. Considers expressive, persuasive, and reference discourse (scientific, informative, and exploratory modes).

ENG 3400 Issues in English Grammar

Explores the nature and rules of grammar. Examines and enlightens concepts and definitions in traditional grammar using tools from contemporary linguistic theory. Contrasts the role of rules as prescriptive conventions or descriptive devices. Considers how sentence structure contributes to meaning in language. Examines the relationship between grammar and dialect, question of standard and nonstandard English, and notions of linguistic competence and linguistic performance.

ENG 3401 Introduction to Semantics

Examines how language constructs meaning. Explores various linguistic levels where meaning resides: word, sentence, intonation, stress, and discourse. Considers non-linguistic factors affecting meaning: context, pragmatic knowledge, and the rules of logic. Investigates such questions as: What are the minimal units of meaning? What elements go into determining meanings? Are there any meaning universals? Are meanings fixed?

ENG 3402 History of English Language

Traces the development of English using linguistic readings and historical documents (letters, journals,

literary selections) from various periods and representing a range of styles (formal to informal). Studies changes in the sound system, inflectional system, vocabulary, and syntax of English, as well as the development of prose style. Considers issues in language change: the influence of foreign invasion, relocation, dialect dominance, and literacy; and specific events such as the Norman invasion and the settlement of America.

ENG 3403 Topics in Linguistics

Explores such issues in linguistics as the lexicon; dialect; metaphor; language and gender; and language and social structure.

ENG 3404 Introduction to Linguistics

Poses the question "What is language?" and takes both an internal and external approach to an answering. Examines the internal organization of linguistic units (phonemes, morphemes, phrases, sentences) in languages as diverse as Arabic, Breton, Xhosa, and Zuni. Discusses how language is learned and used, exploring biological, computational, philosophical, and social facets. Introduces a linguistic perspective on topics of language controversy, including literacy, sexism, language change, and the "innateness question."

ENG 3406 Introduction to Syntax

Explores aspects of language structure through the framework of contemporary syntactic theory. Offers a technical but introductory exploration of the form, function, and relationships of words, phrases, clauses, and sentences. Introduces tools of linguistic analysis and a methodology for examining our internalized knowledge of English sentence composition. Considers language from the perspective of learnability and universal grammar.

Literary Studies

ENG 3358 Topics in Nonfiction Prose

Examines writings in nonfiction prose in such areas as biography, history, science, and technology. Varies according to the design of the instructor.

ENG 3361 Topics in Literary Study

Focuses on literature on a thematic, formal, or generic basis. May include: black women writers, poetry of nature.

ENG 3419 Topics in Genre

Examines such topics in genre criticism as biography, autobiography, satire, and children's literature.

ENG 3420 Contemporary Poetry

Surveys technical and thematic developments of contemporary (including postmodern) American and British poetry. Considers such writers as Bishop, Lowell, Larking, Jennings, Hughes, Heavey, Ashbery, Bronk, Ginsberg, Plath, Rich, Baraka, O'Hara, Tomlinson, Hill, Bly, Merwin, and Merrill. Considers also more "current" writers such as Palmer, Schnackenberg, and Hass, as well as such groups as the L=A=N=G=U=A=G=E poets, and such practices as performance poetry and field composition.

ENG 3421 Modern Poetry

Surveys technical and thematic developments of modern American and British poetry. Considers such writers as Yeats, Frost, Stevens, Eliot, Pound, H. D., Sitwell, Moore, Williams, and Auden. Considers also such issues as canon formation and such “movements” as the Harlem renaissance, as well as the intersections of modernism and postmodernism.

ENG 3622 Topics in Drama

Examines such subjects as tragic drama, comic drama, and absurdist drama.

ENG 3623 Topics in Poetry

Examines such subjects as epic poetry, the lyric, poetry of the seasons, and confessional poetry.

ENG 3624 Topics in Fiction

Examines such subjects as short fiction, the romance, and the short-story cycle.

ENG 3625 Topics in Literary Relations**2 QH**

Explores relations among national literatures. Covers such subjects as modernism in England and America, and romanticism in nineteenth-century England and America.

ENG 3626 Topics in Literature and Other Disciplines

Examines such subjects as literature and the visual arts, literature and psychology, and literary impressionism.

ENG 3627 Topics in Comparative Literature

Examines such subjects as classical backgrounds, nineteenth-century European novel, and postmodernist fiction.

Technical Writing**ENG 3348 Materials and Methods for Technical Writing**

Allows students to research a variety of topics that are germane to teaching, corporate training, and improving one's own technical writing skills. Explores sources of information available to scientific and technical communications, including on-line databases, conventional printed sources, and personnel. Students should plan to take this course early in their graduate studies.

ENG 3349 Workshop in Writing for Publication

Evaluates published articles in scientific, technical, and professional journals and magazines for content, style, tone, format, and mechanical details. Analyzes the article's success, its professionalism, its appropriateness and timeliness, and the professional standards of the journal. Provides for students to research, write, and revise an article for submission to a professional journal of their choice, and for the class to review and edit these articles before submission. Aims at having an article accepted for publication.

ENG 3352 Writing for the Professions

Offers an intensive seminar to professionals who need to compose effective letters, memos, proposals, and reports. Focuses on practical approaches to

clear, concise writing in fields such as business, marketing, and medicine. Emphasis varies each quarter.

ENG 3354 Technical Writing

Concentrates on communicating scientific and technical information to a variety of audiences. Provides practice in the different aspects of the technical process: analyzing the project, gathering information, organizing, designing layout and graphics, writing, revising, and using feedback. Offers opportunities to write several forms of technical communication: proposals, memos, short pieces, and oral presentations, as well as a long technical report. This introductory course is a recommended prerequisite for all other courses. Limited to students in the Master of Technical and Professional Writing Program.

ENG 3355 Topics in Technical Writing

Focuses on specialized topics in professional communication, such as electronic documentation, proposals, and medical writing. Topic varies each quarter.

ENG 3356 Technical Writing Theory and Practice

Examines systematically various theoretical approaches to technical writing as discourse and discipline. Differentiates the aesthetics of technical writing from other forms of discourse through critical analysis of professional writing strategies, based on current theory and research. Allows students to put theory into practice by writing a technical document and a document exploring theoretical issues.

ENG 3365 Professional Presentations

Provides technical and professional writing students with the ability and understanding to make effective professional presentations. Surveys oral communication skills and compares them with written communication skills. Evaluates other types of presentations for their usefulness in technical communication.

ENG 3366 Ethics of Technical and Professional Communication

Explores various philosophical and ethical issues inherent in the practice of technical communication. Takes the position that writing is a political act and considers the questions of ethics and values likely to arise for technical communicators in the course of their work. Expects readings to lay an interdisciplinary foundation for exploring these questions, drawing on the principles of philosophy, semantics, rhetoric, pragmatics, and psychology. Aims to prepare students for long-term careers as humanists in a technological environment.

ENG 3367 Publications Management

Introduces students to the principles of publications management, covering the five topics of design, writing, editing, production, and evaluation. Covers the techniques as well as the principles of publication, design, and production, with emphasis on current technologies used to prepare in-house documents. Emphasizes the problem of matching form and style to audience. Includes a site visit to observe a large in-house production facility. Anticipates students collaboration in small groups to plan, write, and produce a major document.

ENG 3368 Writing for the Computer Industry

Provides the opportunity to write and edit professional-quality computer documentation. Begins with basic instruction sets, increases in difficulty, and prepares students to write a user's guide as a major project for the quarter. Includes a more abstract paper examining trends within the computer industry. Focuses on techniques for creating *readable* documentation, including attention to formatting, graphic design, and text organization. No exams.

ENG 3369 Graphic Design for Technical Writers I

Introduces the fundamentals of graphic design communication. Covers the basics of typography, illustration, photography, color, and layout techniques through lectures, presentations, class discussions, and assignments/critiques. Presents an overview of the creative and production processes as well as an explanation of the basic tools and terminology needed to effectively communicate with print design and production professionals.

ENG 3370 Technical and Scientific Editing

Explores the fundamentals of editing as they apply to science, technical, and engineering writing. Covers the role of the editor in business, industry, and the sciences; basic editorial services such as copy and content editing, production editing, and project editing; the editor as writer and interviewer; and science interpretation and technical translation.

ENG 3371 Pascal for Technical Writers

Introduces Pascal, emphasizing writing structured programs using loops, decision statements, procedures, and functions. Data types include integer, real, char, boolean, and one- and two-dimensional arrays.

ENG 3372 Graphic Design for Technical Writers 2

Considers the specifics of project management and working with design and production professionals in a non-studio course. Includes an analysis of the roles and responsibilities of writers, editors, designers, illustrators, photographers, production artists, typesetters, printers, and other professionals involved in book design and production. Covers budget considerations, scheduling, and manufacturing processes related to publishing. *Prereq.* ENG 3369 or permission of instructor.

ENG 3604 Independent Project, Technical, and Professional Writing

Provides for preparation of portfolio of technical and professional writing done for final project. Limited to students in the Master of Technical and Professional Writing Program.

ENG 3621 C Programming for Technical Writers

Teaches the basic concepts of C to students in the Master of Technical and Professional Writing Program. Covers use of the vi editor, data types, assignment statements, looping, conditional statements, functions, arrays, structures, pointers, and operations on bite.

Technical Writing Training Program**ENG 3614 Principles of Technical Writing**

Introduces the student in the Technical Writing Training Program to the fundamental concepts and principles of technical writing. Includes the definition of technical writing, audience analysis, organization, clarity, and definitional techniques. Provides practice editing and revising existing documentation. Integrates discussion and sound writing techniques with practice in writing original documentation. Limited to students in the Technical Writing Training Program.

ENG 3615 Writing for Computer-Related Industries

Focuses on document preparation and production and on the job environment. Teaches how a documentation department is structured, the phases a document passes through, and how to deal with other departments such as research and development or marketing. Discusses such topics as communication skills, what to expect from other writers and managers, and how to excel within a high tech environment. Limited to students in the Technical Writing Training Program.

ENG 3616 Applied Software Writing

Introduces a range of advanced concepts and processes relating to technical documentation. May include text processing, on-line help, preparing indices and cross-references, and documentation bases. Limited to students in the Technical Writing Training Program.

ENG 3617 Computer Hardware and Organization 4 QH

Introduces students in the Technical Writing Training Program to computer hardware components and how they are organized into a computer system, the components of which include disks, magnetic tapes, printers, the CPU, and memory. Teaches data representation, acquaintance with assembly language, and how a computer stores, addresses, and executes instructions. Explains files, including records, fields, and indexed files. Introduces elementary data structures. Limited to students in the Technical Writing Training Program.

ENG 3618 Programming in C

4 QH

Teaches structured programming using C. Stresses correctness, clarity, and reliability of programs. Offers individual guidance in writing programs and access to Northeastern's computer systems for running programs. Limited to students in the Technical Writing Training Program.

ENG 3619 Operating Systems and Database Management Systems

4 QH

Examines components of an operating system and methods of data storage and retrieval. Offers familiarity with copiers, linkers, the supervisor, and database management systems. Limited to students in the Technical Writing Training Program.

Writing

ENG 3308 Writing and Reading: Composing Processes

Provides teachers with the opportunity to develop a coherent theory of reading instruction coordinated with teaching writing. Recommended for teachers who have previously taken a course in the theory and teaching of writing.

ENG 3309 Writing and Learning Across the Curriculum

6 QH

Explores in-depth how writing may be used to promote thinking and learning across a wide variety of disciplines. Intended primarily for high school and college instructors in the humanities, social sciences, and natural sciences. Usually given only through the Martha's Vineyard Institute on Writing.

ENG 3310 Writing Programs in Schools and Colleges

Examines both the nature of writing programs in schools and colleges and the issues that curricular changes raise for these institutions. Intended for English teachers on all levels who wish to become composition leaders in their schools. Presupposes extensive coursework in composition theory and practice. Usually given only through the Martha's Vineyard Institute on Writing.

ENG 3312 Composition Studies

Provides an introduction in theories of composition.

ENG 3313 Theory and Teaching of Writing

6 QH

Examines several premises of writing instruction and how they can provide successful classroom practices. Designed for teachers or prospective teachers of writing in college or the public schools. Usually given only through the Martha's Vineyard Institute on Writing.

ENG 3314 Writing and Reading: Composing Processes

6 QH

Offers teachers the opportunity to develop a coherent theory of reading instruction coordinated with their teaching of writing. Restricted to teachers who have previously taken a course in the theory and teaching of writing. Usually given only through the Martha's Vineyard Institute on Writing.

ENG 3353 Topics in Writing

Examines various topics in writing and composition.

ENG 3357 Computers and Writing

Explores the two major uses of computers in writing instruction: word processing and computer-assisted instruction. Concentrates on the rudiments of word processing, hands-on experience, classroom exercises, and teaching strategies. Includes demonstrations of prewriting, organizing, and revising software, and strategies for developing CAI in composition, and a brief introduction to programming language. Usually given only through the Martha's Vineyard Institute on Writing.

ENG 3359 Writing Workshop 1

Provides advanced training in varied forms of writing. May include such specialized areas as fiction, poetry, professional writing, and writing for academic administrators. Requires intensive student writing and

extensive instructor comment. Usually given only through the Martha's Vineyard Institute on Writing.

ENG 3360 Writing Workshop 2

6 QH

Provides advanced training in varied forms of writing. May include such specialized areas as fiction, poetry, and professional writing for academic administrators. Requires intensive student writing and extensive instructor comment. Usually given only through the Martha's Vineyard Institute on Writing.

ENG 3380 Prose Writing 1

Surveys writing of various types of nonfiction prose, including reviews, reports, biography, commentary, research, personal narrative, travel, and others developed by the participant in consultation with the instructor. Focuses on concepts of content, point of view, organization style, and stages of composition. Usually given only through the Martha's Vineyard Institute on Writing.

ENG 3381 Prose Writing 2

Continues ENG 3380. Attempts to reinforce writing theory and practice, to introduce the professional concerns of writers, and to prepare writing for possible publication. Provides for participants to refine techniques of composition and to examine the rhetorical methods of description, narration, exposition, and persuasion. Reviews such writers' markets as newspapers, popular magazines, and scholarly journals. When possible, will feature professional writers as guest speakers. Usually given only through the Martha's Vineyard Institute on Writing.

ENG 3382 Responding to Writing

Examines and puts into practical use a variety of methods of analyzing writing. Studies both professional and student writing. Provides the tools for analyzing and improving student writing, assessing the writing of their students, and designing appropriate writing assignments and activities. Provides an opportunity to begin the development of an integrated writing curriculum from the elementary to the college level.

ENG 3383 The Composing Process

Based on the premise that the key to teaching writing is teaching revision strategies. Participants look at the research studies of elementary, secondary, and college students and examine manuscripts of professional writers such as E. B. White. Focuses on both the theory and practice of revising. Covers understanding students' assumptions about the writing/revising process; teaching revision strategies; using student writing to teach revision; responding to student writing within the context of revising; and analyzing personal revision strategies. Explores how participants can use what they know about their own revising strategies to teach revision. Usually given only through the Martha's Vineyard Institute on Writing.

ENG 3384 Rhetorical Theory

Traces the history of rhetoric and examines the major contemporary theories in the field. Considers the classical rhetoric of Aristotle, Plato, Cicero, and

Quintilian and ends with the modern formulations of rhetoric by I. A. Richards, Philip Wheelwright, Alexander Bain, James Moffett, and James Kinneavy. Examines rhetoric in terms of traditional modes of classifying discourse—description, narration, exposition, and persuasion—as well as modern reclassifications—expressive, referential, literary, and other modes. Reviews rhetorical strategies for invention in the composing process: Burke's dramatistic method, Rohman's prewriting, and Pike's tagmenics. Usually given only through the Martha's Vineyard Institute on Writing.

ENG 3385 Writing about Literature and Other Disciplines

Examines some characteristic student and professional writing in the humanities, sciences, and social sciences. Attempts to help participants see how students can use writing as a way of knowing and learning, not just in the English class but, for example, in the biology, history, or even mathematics class. Usually given only through the Martha's Vineyard Institute on Writing.

ENG 3386 Research in Composition

Prepares publication of research by providing a working knowledge of sources, current scholarship, and standards of publication. Acquaints participants with various bibliographies, journals, texts, and monographs that constitute the important documents of the field. Uses these documents to pursue research topics in invention, structure, and form, modes of discourse, the composing process, and pedagogy. Usually given through the Martha's Vineyard Institute on Writing.

ENG 3389 Case Study Analysis

1 QH

Provides for participants who have prepared ENG 3388 projects to present their findings, draw their

conclusions, and discuss the implications of their research for further study. Guides participants toward possible publication of their work in relevant composition journals. Concludes the ENG 3387, ENG 3388, and ENG 3389 sequence. Usually given only through the Martha's Vineyard Institute on Writing.

ENG 3391 Fieldwork

Allows participants to conduct the independent research planned in ENG 3387. Provides resources available for this research at the home institution, including the participants' individual teaching practices, course or departmental curriculum, the writing of their students and of students in other classes, the practices of other teachers and administrators, as well as published books, reports, and articles on composition. Provides for students to collect, collate, and interpret data according to the guidelines established at the institute and then prepare a project in which they present their findings. Usually given only through the Martha's Vineyard Institute on Writing.

ENG 3392 Case Study Design

2 QH

Prepares participants for research to be conducted in ENG 3388 during the academic year at the home institution. Examines some published case studies of teaching and writings and explores relevant methods of data analysis, observation techniques, interview and questionnaire construction, sampling procedures, experimental design, and writing protocol analysis. Usually given only through the Martha's Vineyard Institute on Writing.

ENG 3620 Rhetoric

Introduces students to the ideas and scholarship of the major periods of rhetorical developments and allows students to explore the definition of "rhetoric" in ways most meaningful to individual interests.

History

All courses carry three quarter-hours of credit except seminars, which carry four quarter-hours, and other courses where noted.

HST 3241 Methodology

Explores the objectives, methods, and resources of the historian.

HST 3242 European Historiography

Analyzes the development of historical writing from ancient times to the present.

HST 3243 American Historians

Covers the writing of American history by Americans, from colonial times to the present, with emphasis on changes in both form and substance.

HST 3244 Global Historiography

Reviews the literature on world history, focusing on authors such as Oswald Spengler, Arnold Toynbee, and William McNeill, and on the field of world history since 1960. Addresses the principal methods,

paradigms, and interpretations in world history for the premodern, early modern, and recent periods.

HST 3306 The Renaissance (Group 1)

Discusses European political and cultural life from the thirteenth to the seventeenth centuries, with attention to humanism and to the rebirth of classicism in literature and the arts.

HST 3308 Topics in Early Modern Europe (Group 1)

Examines recent interpretations of and approaches to such topics as the Renaissance and Reformation; the "crisis" in Europe, 1540–1660; gender roles; the French Revolution; and popular culture. Emphasizes recent monographs and journal literature. Requires oral presentations and short critical essays.

HST 3322 Socialism and Revolution (Group 1)

Studies the history of socialism and revolution from the early nineteenth-century utopias to the New Left of the 1960s.

HST 3339 The Modernization of Ireland (Group 1)

Analyzes themes in the growth and development of modern Ireland. Examines migration and its effects on a traditional society, the role of religion in the assertion of national independence, and modernization within the British nexus.

HST 3345 Hitler's Germany (Group 1)

Studies the history of the Third Reich, including an in-depth analysis of the process by which the political motives and methods of the Nazis ultimately won the support of the German people.

HST 3380 Seminar in the Renaissance (Group 1)

Offers research and writing concerning the Renaissance.

HST 3381 Seminar in the Reformation (Group 1)

Offers research and writing concerning the Reformation.

HST 3384 Seminar in Twentieth-Century Europe (Group 1)

Studies a selected controversy in contemporary European history.

HST 3385 Seminar in European Social History (Group 1)

Focuses on Britain, France, and Germany in the nineteenth and early twentieth centuries and looks at history "from below." Examines comparative issues in European social history. Includes the nature of social protest, the rise of organized labor, and the impact of war and revolution on the lives of ordinary people.

HST 3388 Seminar in Work, Culture, and Society in Modern Europe (Group 1)

Examines the history of work in nineteenth- and twentieth-century Europe, especially in France, Britain, and Germany. Examines work as both a cultural and an economic activity.

HST 3389 Seminar in the Modern France (Group 1)

Includes research, writing, and collective analysis of several themes in modern French social history since 1789, including the role of social class in revolutionary protest, industrialization, technology and modernization, the rise of the working class and the development of organized labor, the French peasantry in an industrial society, and the nature of the family and women's roles.

HST 3397 Seminar in Comparative Labor History (Group 1)

Analyzes issues in the history of the European labor movement, focusing on nineteenth- and twentieth-century Britain, France, and Germany. Includes the meaning of the concept of class in labor history; labor movements and politics (working-class conservatism and working-class radicalism); the place of women in the working class and in the labor movement; and worker responses to mechanization, automation, and scientific management in the twentieth century.

HST 3399 Seminar in Approaches to Women's History (Groups 1, 2, or 3)

Focuses on current issues in women's history and the methods historians use to study women's historical roles in the market place, work force, political arena, and domestic scene in Europe, Asia, the United States, and Latin America. Emphasizes the importance of comparative and interdisciplinary approaches to the history of women. Includes lectures and discussions with specialists using various approaches, assigned reading, and an independent project.

HST 3405 Colonial America: The Eighteenth Century (Group 2)

Covers the expansion of the English colonies in the New World, the development of political and social institutions, and the sources of friction with England to 1763.

HST 3410 Topics in American Reform (Group 2)

Studies movements to change aspects of American society.

HST 3413 Topics in the Civil War and Reconstruction (Group 2)

Analyzes key issues surrounding the events leading up to the Civil War, the war itself, and the Reconstruction period.

HST 3421 Political Change in Twentieth-Century America (Group 2)

Analyzes the growth of governmental function and structure, emphasizing the evolution and administration of leading policy concerns of the current century, changes in federalism and intergovernmental relations, and patterns of popular political participation and thinking.

HST 3423 The Age of Roosevelt (Group 2)

Analyzes the foreign and domestic policies and programs of the four Roosevelt administrations, set within the context of the worldwide depression and global war. Emphasizes the range of recent interpretations and analytic methods used in evaluating the place of Roosevelt in American history.

HST 3431 History of American Religion (Group 2)

Provides an overview of American religious culture, focusing on topics that illustrate its diversity and its impact on members and on society at large.

HST 3434 United States Social History in the Twentieth Century (Group 2)

Examines the recent literature on such topics as family, gender, class, migration, ethnicity, race, work, leisure, fertility, health, mortality, deviance, and social policy.

HST 3436 American Education in World Perspective (Group 2)

Examines the expansion of public education from the passage of compulsory schooling laws to the establishment of the multi-university and the problems facing American education in the 1990s. Gives attention to views that common schooling and land-grant colleges were part of the larger movement to extend

democracy and to the ideas of reformers such as Horace Mann and Henry Barnard. Examines challenges to these propositions in detail.

HST 3440 African-American History 1 (Group 2)

Covers the history of African-Americans to 1900, with emphasis on the role of black people in slavery and freedom.

HST 3441 African-American History 2 (Group 2)

Considers African-American history since 1900.

HST 3450 Boston as a City (Group 2)

Examines historic Boston from 1822 to the present. Emphasizes Boston's early growth as a city, the Hub as a center of pre-Civil War reform, the coming of the Irish, Boston as America's Athens, the revolutionary shift from Yankee to Irish political domination, the flamboyant era of James Michael Curley, and the development of the "New Boston."

HST 3460 Life at Sea (Group 1)

Examines the role of the individual at sea through history and literature. Emphasizes the concepts of ship-board law and authority as well as observations on the notion of the "voyage" and the maturation process. Requires an all-day Saturday field trip.

HST 3480 Seminar in American History (Group 2)

Offers research and writing on selected aspects of American history.

HST 3481 Seminar in Colonial and Revolutionary America (Group 2)

Offers research and writing on selected topics in American history prior to 1789.

HST 3482 Seminar in American Governmental History (Group 2)

Concentrates attention on a particular problem or theme in American governmental history, emphasizing individual student research and writing.

HST 3485 Seminar in African-American History (Group 2)

Offers research and writing on an aspect of African-American history.

HST 3486 Seminar in Recent American History (Group 2)

Studies special topics from the period 1896 to the present in detail. Requires presenting a research paper on a major person, action, or movement.

HST 3501 History of Exploration (Group 3)

Surveys comprehensively exploration from ancient times to the present with emphasis on the motives for exploration and their impact on the regions discovered and on those doing the discovering.

HST 3508 Modern Africa (Group 3)

Offers a topical approach to the history of Africa since 1850.

HST 3509 Pan-Africanism (Group 3)

Explores black political thought in Africa and the Americas during the nineteenth and twentieth centuries in the context of modern nationalism and capitalism.

HST 3510 History of the Islamic Peoples (Group 3)

Studies the history, culture, and religion of the followers of Muhammad from 600 to 1800.

HST 3512 Modern Middle East (Group 3)

Studies the Middle East in the twentieth century.

HST 3523 Modern Japan (Group 3)

Discusses the history of Japan since the fall of the Tokugawa, emphasizing political and economic developments, especially after World War II.

HST 3529 Communism in China (Group 3)

Studies the Chinese Communist movement from its origins in the 1920s to the present.

HST 3530 Seminar in Western Perceptions of China (Group 3)

Explores the sources and implications of cultural myths and stereotypes. Focuses on how western images of China developed and how they affected, often negatively, China's relations with the west. Challenges students to develop cross-cultural analytical skills, taking into account the limitations of the observer and the observed, and to engage in acute and conscientious cultural self-reflection.

HST 3531 Population in History (Group 3)

Applies demographic theory to history.

HST 3540 Economic History of the Modern Western World (Group 3)

Analyzes the economic development of the modern Western world.

HST 3600 Introduction to Public History (Group 3)

Surveys career options for historians working outside the academy. Examines the educational, ethical, and legal issues involved in historic preservation, archive and museum management, public policy planning and analysis, cultural resource management, and private sector application of the historian's craft.

HST 3601 Historical Administration (Group 3)

Considers the administration of historical agencies with attention to problems of finance and personnel and to the legal-governmental environment in which agencies operate.

HST 3602 Historical Societies and Archives (Group 3)

Analyzes the varieties of historical societies (local, state, and national) and the kinds of private (business, college, and church) and public (local, state, and national) archives; their activities and procedures; and their similarities and differences.

HST 3603 Historical Exhibits and Museums (Group 3)

Studies approaches, techniques, and special problems in the presentation of history to the public through exhibits, films, and other audiovisual and written media. Presents guest lecturers from the field and gives students the opportunity to gain practical experience.

HST 3605 Historical Editing (Group 3)

Presents a laboratory for the study and practice of historical editing. Introduces the major collections of edited papers and instructs students in editing historical

documents. Gives each student a historical document to prepare for publication. Also covers the editing of history books and journals.

HST 3607 Historical Consulting (Group 3)

Surveys the professional and business skills necessary to work as an independent historical consultant or to start and successfully operate a consulting firm. Topics include identifying fields and clients, marketing, service development, computer management, ethics, and confidentiality.

HST 3610 Industrial Archaeology (Group 3)

Introduces the history, practice, and place of industrial archaeology. Plans examination of techniques and procedures used to unearth the industrial past and field trips to local industrial sites.

HST 3611 Historic Preservation (Group 3)

Introduces historic preservation, with attention to the history, the philosophy, and the practical problems of preservation.

HST 3612 Studies in Material Culture (Group 3)

Investigates strategies for examining material culture, including architecture, historic archeological remains, and the artifacts of domestic and work lives, as sources for historical study.

HST 3613 Historical Analysis of Public Policy (Group 3)

Introduces the historical study of public policy, concentrating on theoretical and methodological issues. Substantive illustrations focus mainly on the United States.

HST 3620 Oral History (Group 3)

Discusses the theory and practice of creating, processing, and using primary source material obtained by taping interviews with people whose role in history would otherwise go unrecorded.

HST 3621 Genealogical Research: Methods and Uses (Group 3)

Analyzes the tools and sources available to genealogists and historians with attention to historical applications of such data. Gives students the opportunity to use various records essential to the writing of family history.

HST 3622 Local History Methodology (Group 3)

Examines the development and uses of local history with special attention to the methodological aspects of this rapidly growing field. Gives students the opportunity to survey resources for a local community, prepare a demographic essay, and examine recent scholarship in local history.

HST 3625 Media and History (Group 3)

Explores such topics as the advantages and drawbacks of specific media, the uses and abuses of

media in research and teaching, and the construction of media. Requires each student to participate in a research project involving the creation and/or evaluation of historically valid films, slide tapes, and other materials.

HST 3798 Master's Continuation

0 QH

HST 3805 Assigned Reading

1 QH

Offers assigned reading under supervision of a faculty member.

HST 3806 Assigned Reading

2 QH

Offers assigned reading under supervision of a faculty member.

HST 3807 Assigned Reading

3 QH

Offers assigned reading under supervision of a faculty member.

HST 3808 Assigned Reading in Historical Geography

Offers directed study in geography's impact on history. This course may be used to satisfy state requirements in geography for teaching certification in social studies or history.

HST 3811 Thesis

3 QH

Offers thesis supervision by members of the department.

HST 3812 Thesis

3 QH

Offers thesis supervision by department members.

HST 3813 Thesis

3 QH

Offers thesis supervision by members of the department.

HST 3821 Fieldwork in History 1

4 QH

Offers students the opportunity to get practical experience in historical agencies including historical societies, archives, museums, exhibits, restorations, preservation projects, and the like. Requires students to work in the agency eight to ten hours a week for one quarter under the direction of an agency supervisor and departmental adviser.

HST 3822 Fieldwork in History 2

4 QH

Gives students a second opportunity to acquire practical experience in an historical agency. Requires eight to ten hours a week for one quarter under the direction of an agency supervisor and a departmental adviser.

HST 3823 Fieldwork in History 3

4 QH

Gives students a third opportunity to acquire practical experience in an historical agency. Requires eight to ten hours a week for one quarter under the direction of an agency supervisor and a departmental adviser.

Journalism (School of)

All courses carry four quarter-hours of credit unless otherwise specified.

JRN 3201 Reporting

Offers extensive practice in researching and writing news and feature stories. Analyzes methods of gathering information from government documents and court records.

JRN 3432 Local Government Reporting

Explores coverage of municipal government, with emphasis on the "beat" approach to reporting public affairs. Emphasizes practical experience in such projects as covering town meetings, board of selectmen, and other commissions and boards.

JRN 3501 History of Journalism

Examines American journalism from European and English roots. Topics include the colonial press, the great personal journalists of the nineteenth century, and the impact of major technological changes in the news media in the twentieth century.

JRN 3508 Law of the Press

Examines libel, invasion of privacy, access to government information, and other legal matters pertinent to the news media.

JRN 3512 Journalism Ethics and Issue

Discusses responsibilities of news media, ethical problems confronting decision makers in various journalistic fields, and the principles found in codes of various professional societies.

JRN 3522 Magazine Writing

Covers writing and free-lancing magazine articles, analyzing magazines as markets, and selecting the best feature format: how-to-do-it, profile, personal experience, human interest, interpretive pieces, and others.

JRN 3575 News Media Management

Examines the organizational structure, production methods, and management procedures of news media companies. Explores interaction among various departments of the company and the company's interaction with the market served.

JRN 3617 The Constitution and Mass Communications

Explores freedom of the press through the study and discussion of the First Amendment and other relevant constitutional provisions. Analyzes the impact on the news media of evolving Supreme Court interpretations of the Constitution.

JRN 3678 Applied Leadership Techniques

Focuses on establishing and maintaining internal communications, coaching, developing employees, understanding motivations, solving problems, making decisions, redesigning jobs, and analyzing leadership styles for news media application.

JRN 3679 Research Methods in Journalism

Examines the quantitative and qualitative methods of scientific inquiry as they relate to the journalist as a social scientist. Covers random sampling, content analysis, field experiments, and basic statistics.

JRN 3682 Mass Communication Theories

Examines the major theories regarding the process, nature, and influence of mass communications. Studies communications in a theoretical and research-oriented context.

JRN 3684 Literature of Journalism

Studies numerous authors and observers of the journalism profession via their works to provide a wide-ranging view of journalism, its nature and impact.

JRN 3691 Professional Paper

Analyzes a publication by the case method, using theoretical and practical perspectives. The student's paper will analyze the publication's weaknesses and strengths and pose possible solutions.

JRN 3710, JRN 3720, JRN 3730 Topics 4 QH each

Requires advanced work to develop media skills not covered in other classes. May be repeated as subject matter changes.

JRN 3798 Master's Continuation 0 QH

JRN 3870 Graduate Seminar

Examines the mass media as an integral institution in society, focusing on topics of current significance. May be repeated as subject matter changes.

JRN 3890, JRN 3891 Directed Study 4 QH each

Offers students work on individual projects under the supervision of an instructor. May be repeated once.

JRN 3893, JRN 3894 Thesis 4 QH each

Focuses on preparing a master's thesis under supervision of a faculty committee.

JRN 3895, JRN 3896 Reporting Practicum 4 QH each

Focuses on preparing a series of in-depth stories on a specialized area that will be presented to appropriate media for publication.

Law, Policy, and Society

Core Courses

ECN 3315 Economics of Law and Public Policy 3 QH

Builds on a knowledge of intermediate microeconomic theory in evaluating the impact of laws and public policies. Relies on economic models of behavior and social welfare for economic analyses of government intervention and public policy programs. Studies unregulated market behavior, market failure and public intervention, policy and program evaluation, and the economics of contract and tort law. Limited to Law, Policy, and Society students unless students have special permission from the instructor. *Prereq.* ECN 3010 or permission of instructor.

INT 3249, INT 3250 Law, Policy, and Society Survey 2 QH

Introduces students to methodologies and perspectives used in several disciplines in studying law and society. Examines such issues as normative versus formative functions of law, social control versus individual freedom, and legal bases of conflict management in society. The course is coordinated by one instructor but lectures are given by a number of faculty members affiliated with the program to provide students with a variety of perspectives.

LAW 2364 Legal Research and Bibliography 1 QH

Introduces students to the resources and the use of the Law Library and the basic techniques of legal research. Open only to Law, Policy, and Society students.

POL 3604 Techniques of Policy Analysis 3 QH

Provides a systematic approach to understand the origins, formulation, implementation, and impact of government policy. Reviews key analytical concepts and competing theoretical perspectives. Considers both the political dimensions of public policymaking and the technical aspects of program design within the "natural history" of the policymaking process. Draws on case materials from a spectrum of policy areas.

SOC 3330 Theoretical Traditions in Law, Policy, and Society 2 QH

Studies different interpretations of how the law works and what its foundations are. Examines legal realism, law and economics, Marxism, critical legal studies, functionalism, conflict theory, and natural law. Examines the policymaking implication of each of these schools, each school's program for research, and the social issues each school considers worthy of attention.

Methodology Courses

SOC 3113 Introduction to Research Methods 2 QH

Introduces methods of social research including such approaches as field study and participant observation techniques, survey techniques, interviewing and questionnaire construction, sampling procedures, experiment design, content analysis, and use of available data. Open only to Law, Policy, and Society students.

SOC 3114 Introduction to Quantitative Research Methods 2 QH

Introduces quantitative techniques of analysis of policy. Requires students to conduct individual projects. Open only to Law, Policy, and Society students. *Prereq.* SOC 3113 or equiv.

Directed Study and Dissertation

INT 3859 Directed Study in Law, Policy, and Society 2 QH

INT 3860 Directed Study in Law, Policy, and Society 3 QH

INT 3862 Directed Study in Law, Policy, and Society 4 QH

Involves independent reading and research with a faculty member.

INT 3861 Dissertation 0 QH

INT 3799 Dissertation Continuation 0 QH

Mathematics

MTH 3020 Basics of Analysis 4 QH

Investigates differential calculus, including topology of \mathbb{R}^n , compact and connected sets, continuous maps, uniform convergence, differentiable maps, the inverse and implicit function theorems, Riemann integrations, and change of variables. Course should be taken in addition to the required coursework in mathematics. *Prereq.* MTH 1311 or equiv.

MTH 3101 Analysis 1: Real Analysis 4 QH

Studies real analysis: integration, differentiation, and measure theory. *Prereq.* MTH 3020 or equiv.

MTH 3102 Algebra 1: Linear Algebra 4 QH

Considers vector spaces, linear maps, dimensions, inverse matrices, eigenvalues, eigenvectors, determinants, symmetric, Hermitian and Unitary matrices, Jordan canonical form, and multilinear algebra. Introduces group theory: definition, subgroup, and the symmetric group.

MTH 3103 Analysis 2: Complex Analysis 4 QH

Examines complex function theory: holomorphic and meromorphic functions, calculus of residues, conformal mappings. *Prereq.* MTH 3020 or equiv.

MTH 3104 Algebra 2: Groups, Rings, and Modules 4 QH

Focuses on groups: subgroups, quotient groups, homomorphisms, and examples and classification of groups of small order. Studies rings: homomorphisms, ideals, quotient rings, integral domain, extension of rings, Unique factorization domain, Chinese remainder theorem, and Gauss' lemma. Explores modules: homomorphisms, submodules, quotient modules, exact sequence, structure of matrices and finitely generated modules over a PID, and structure theory of infinitely generated abelian groups.

MTH 3105 Topology 1 4 QH

Explores elements of point set topology, including general topological spaces, compactness and connectedness, products, and quotients. Also considers elements of algebraic topology, including homotopy, fundamental group, and covering spaces. Provides applications to simplicial complexes.

MTH 3106 Analysis 3: Functional Analysis 4 QH

Analyzes topological linear spaces, normed and Banach spaces, linear functionals, weak topology, linear operators, and Hilbert spaces. *Prereq.* MTH 3101.

MTH 3107 Topology 2: Homology Theory 4 QH

Explores singular homology groups, induced homomorphisms, exact homology sequence of a pair, excision, Mayer-Vietoris sequence, homology of CW complexes, and applications.

MTH 3222 Applied Statistics 4 QH

Considers level to measurement, central tendency, dispersion, relatedness and significance to differences, analysis of data through correlation, regression, F-test, Chi square tests, T-test, analysis of variance and analysis of covariance. Uses computer-based statistical subroutine packages. Not for math graduate credit.

MTH 3230 Introduction to Computer Programming and Applications 2 QH

Introduces graduate students in sciences, social sciences, and humanities to computer programming and to the role of the computer in solving problems in their areas of study. Teaches students to write and run programs in the language BASIC and to use the computer for software packages related to various fields of endeavor. Not for math graduate credit.

MTH 3231 Introduction to Computer Programming and Applications 4 QH

Aims at graduate students in sciences, social sciences, and humanities who need to understand how computers can help solve problems in their fields of study. After instruction in the basics of computer programming and algorithm development, introduces students to examples of the computers used in different areas of human endeavor. Requires students to write programs in BASIC programming language and run them on a computer. Not for math graduate credit.

MTH 3321 Algebra 3: Galois Theory 4 QH

Studies finite extensions of fields, automorphisms, structure of finite fields, normal and separable extensions, Galois group, Fundamental Theorem of Galois

Theory, cyclotomic fields, solvability of equations by radicals, and applications (for example, coding theory).

MTH 3332 Commutative Algebra 4 QH

Covers prime ideals, localization, integral extensions; primary decomposition; Krull dimension; chain conditions, Noetherian and Artinian modules; and additional topics from ring and module theory as time permits.

MTH 3341 Ordinary Differential Equations 1 4 QH

Explores existence and uniqueness theorem, methods of explicit solution for equations and linear systems, regular singular points, Sturm-Liouville systems, and expansions in eigenfunctions.

MTH 3342 Ordinary Differential Equations and Applications 2: Dynamical Systems 4 QH

Studies linear systems and the existence and uniqueness of solutions. Introduces dynamical systems: flows, stability, electric circuits, Poincare-Bendixson theorem, and closed orbits.

MTH 3343 Ordinary Differential Equations and Applications 3: Topics 4 QH

Deals with advanced topics in dynamical systems, such as Chaos or Hamiltonian systems, as determined by instructor.

MTH 3353 Partial Differential Equations and Applications 1 4 QH

Investigates first-order quasilinear and general nonlinear equations: method of characteristics; second-order hyperbolic, elliptic, and parabolic equations: separation of variables, potential theory, and Fourier transform. Applications include geometric optics; light, sound, and water waves; electric field theory; and heat diffusion. *Prereq.* Undergraduate differential equations.

MTH 3355 Partial Differential Equations and Applications 2 4 QH

Studies nonlinear second-order partial differential equations, method of successive approximations, and hyperbolic systems. Explores local and global existence for nonlinear diffusion equations, and variational and fixed-point methods for nonlinear elliptic equations. Applications may include gas dynamics, simple models of turbulence, and differential geometry. *Prereq.* MTH 3353.

MTH 3361 Numerical Analysis 1 4 QH

Studies topics such as floating point arithmetic, root finding, divided differences, interpolation and approximation, numerical integration, solution of differential equations, and numerical linear algebra. Students are expected to be reasonably proficient in Pascal, FORTRAN, or C. Requires writing computer programs.

MTH 3362 Numerical Analysis 2 4 QH

Studies the numerical solution of partial differential equations, with emphasis on elliptic equations and the finite element method. Same as COM 3762. *Prereq.* MTH 3361 or equiv.

MTH 3371 Optimal Control Theory 1 4 QH

Considers linear and nonlinear control problems defined by ordinary differential equations, relaxed controls, existence theorems, and Pontryagin's maximum principle.

MTH 3373 Optimization 4 QH

Analyzes convex sets, linear and nonlinear programming, zero-sum games, dynamic programming, and iterated methods.

MTH 3386 Lie Theory 4 QH

Examines Lie groups and Lie algebras, the exponential map, examples, basic structure theorems, representation theory, and applications. Additional topics vary with the instructor and may include infinite-dimensional Lie algebras, algebraic groups, finite groups of Lie type, geometry, and analysis of homogeneous spaces.

MTH 3400 Geometry 1 4 QH

Discusses manifolds, differentiable structures, tangent bundles, tensors, vector fields and differential equations, Frobenius integrability theorem, and differential forms.

MTH 3402 Algebraic Geometry 1 4 QH

Concentrates on the techniques of algebraic geometry arising from commutative and homological algebra, beginning with a discussion of the basic results for general algebraic varieties, and developing the necessary commutative algebra as needed. Considers affine and projective varieties, morphisms of algebraic varieties, regular and singular points, and normality. Discusses algebraic curves, with a closer look at the relations between the geometry, algebra, and function theories. Examines the Riemann-Roch theorem, together with its many applications to the study of the geometry of curves. Studies the singularities of curves. *Prereq.* MTH 3102 and MTH 3104.

MTH 3407 Geometry 2 4 QH

Examines integration on manifolds, Stokes' theorem, de Rham cohomology, and Riemannian metrics: first variation formula for arc length, geodesics, exponential maps, and geodesic completeness. Introduces Lie groups: left invariant vector fields, Lie algebras, subgroups and subalgebras, homomorphisms, one-parameter subgroups, exponential maps, bi-invariant metrics, and structure equations.

MTH 3411 Differential Geometry 4 QH

Analyzes geometry of surfaces in the Euclidean space, with emphasis on the global aspects, using the technique of tensor calculus. Explores elements of Riemannian geometry, connections, and holonomy.

MTH 3431 Probability 1 4 QH

Introduces probability; independent random variables; types of convergence; laws of large numbers; characteristic functions; and central limit theorem.

MTH 3432 Probability 2 4 QH

Introduces stochastic processes; random walk; conditional expectations; Markov processes; multivariate normal distribution; and Brownian motion.

MTH 3441 Statistics 1 4 QH

Explores parametric families of distributions; estimation and maximum likelihood; confidence intervals; testing hypotheses; and likelihood ratio. Measure theory is not a prerequisite.

MTH 3443 Statistical Decision Theory 4 QH

Presents subjective probability and utility. Studies Bayesian approach to decision problems, including estimation, testing hypotheses, and linear statistical models. Considers sequential decisions, and admissibility.

MTH 3444 Analysis of Variance 4 QH

Discusses one-sample and two-sample tests; one-way ANOVA; factorial and nested designs; Cochran's theorem; regression; analysis of covariance; and simultaneous confidence intervals.

MTH 3445 Topics in Statistics 4 QH

Includes multivariate statistics and clustering; biostatistics; Stein's paradox and admissibility, foundations; and probabilistic and inferential aspects of reliability theory.

MTH 3448 Nonparametric Methods in Statistics 4 QH

Presents methods for analyzing the data that is not necessarily normal. Emphasizes comparing two treatments (the Wilcoxon test, Kolmogorov-Smirnov test), comparison of several treatments (the Kruskal-Wallis test), randomized complete blocks, tests of randomness and independence, and asymptotic methods (the 8 method, Pitman efficiency).

MTH 3450 Categorical Data Analysis 4 QH

Focuses on the analysis of data in tables, that is, with cross-classified data. Includes loglinear models (a generalization of analysis of variance methods) and logistic regression. Includes homework problems involving real data and sometimes focusing on theoretical issues.

MTH 3452 Time Series 4 QH

Includes analysis of time series in the time domain, the frequency domain, and ARMA models.

MTH 3460 Pattern Recognition 4 QH

Introduces the methods of pattern recognition: multivariate normal distribution, linear discriminant analysis, logistic regression, tree structured classification, cluster analysis, jackknifing and bootstrapping, and cross-validation. This course is intended for students interested in computer science or applied statistics.

MTH 3481 Topology 3: Cohomology Theory 4 QH

Studies homology with coefficients, cohomology groups, cup and cap products, the cohomology ring, Künneth theorem, spectral sequence of a fibration, duality in manifolds, and applications.

MTH 3501 Data Structures 4 QH

Considers basic structure for representing and manipulating data in computer programming: arrays, lists, stacks, queues, dequeues, trees, and binary trees. Studies applications to nonnumeric computations and searching and sorting. Requires students to

write programs to implement these structures on a computer.

MTH 3514 Algebraic Algorithms 4 QH

Offers topics in algebraic algorithms in a different subspecialty each time. Topics will be chosen from: computational group theory, computational number theory, algorithms for computing with finite fields, the discrete Fourier Transform and its applications, the Knuth-Bendix algorithm for finitely presented algebras, polynomial factorization, and related topics in computer algebra. Same as COM 3741.

MTH 3515 Parallel Computation 4 QH

Considers algorithms and theories for parallel computation on fixed-connection networks and on concurrent systems having a fixed number of processors. Includes algorithms for sorting, priority queues, graph algorithms, matrix multiplication, and FFT. Allows students use of a network of micros to implement some of these algorithms. May include applications to VLSI design. Same as COM 3640.

MTH 3521 Automata and Formal Languages 4 QH

Explores formal models of computation and regular expressions; properties of regular sets; context-free languages and pushdown automata; Chomsky hierarchy; and computability and undecidability. Same as COM 3710.

MTH 3522 Foundations of Artificial Intelligence 4 QH

Examines searching, goals, plans, heuristics, and representation of knowledge: nets, frames, and inheritance. Covers logic and its role in artificial intelligence, and selected applications of these ideas in other areas of artificial intelligence. Same as COM 3410. *Prereq.* MTH 3501 and another computer related course.

MTH 3524 Discrete Mathematical Models 4 QH

Introduces the notion of mathematical model, develops mathematical models relevant to problems in psychology, sociology, environmental science, political science, and other topics. Emphasizes the use of discrete mathematical tools such as graph theory, Markov chains, and game theory.

MTH 3527 Combinatorics 1: Enumeration 4 QH

Examines various techniques of enumerative combinatorics, including binomial and multinomial theorems, principle of inclusion-exclusion, recurrence relation, and generating functions. Considers Stirling numbers. Covers special topics such as distributions, partitions, and polycounting theory. Discusses topics in Matching Theory, including Hall's theorem, and Marriage Problem and Rado's Selection Principle.

MTH 3528 Combinatorics 2: Coding Theory and Block Designs 4 QH

Explores block designs, including t-designs, orthogonal Latin Squares, difference sets and finite geometries. Includes algebraic coding, including cyclic codes, Reed-Solomon codes, BCH codes, and Reed-Muller codes. *Prereq.* MTH 3102.

MTH 3529 Graph Theory 4 QH

Examines graphs and subgraphs; trees; connectivity; Euler tours and Hamilton cycles; matchings, edge colorings; independent sets and cliques; vertex colorings; planar graphs; directed graphs; networks, the cycle space; and bond space.

MTH 3530 Topics in Combinatorics 4 QH

Focuses on topics in combinatorics in a different subspecialty each time. Includes topics such as game theory, combinatorial geometry, measurement, and algebraic combinatorics.

MTH 3534 Analysis of Algorithms 4 QH

Discusses design and analysis of fast algorithms. Topics include advanced data structures: representing partitions, union-find algorithms, and priority queues; graph algorithms: bioconnectivity, maximum flow, shortest path, and matching minimum spanning tree; algebraic problems: matrix multiplication, polynomial multiplication, string matching, and linear programming; and probabilistic algorithms: tests for primality, and factoring polynomials and integers. Same as COM 3390.

MTH 3535 Complexity Theory 4 QH

Analyzes theory of relationships among complexity classes of algorithms. Covers sequential, deterministic, parallel, non-deterministic, and probabilistic models of computation, and Turing and decision tree models. Considers the class NP, and questions of completeness, especially NP-completeness, reducibility, and hierarchy of complexity classes. Same as COM 3730.

MTH 3798 MS Continuation 0 QH

MTH 3799 PhD Continuation 0 QH

MTH 3804 Readings in Combinatorics 4 QH

MTH 3806 Readings in Algebra 4 QH

MTH 3807 Seminar in Algebra 4 QH

MTH 3811 Readings in Analysis 4 QH

MTH 3812 Seminar in Analysis 4 QH

MTH 3818 Seminar: Dynamical Systems 4 QH

MTH 3821 Readings in Topology 4 QH

MTH 3822 Seminar in Topology 4 QH

MTH 3824 Readings in Geometry 4 QH

MTH 3826 Readings in Statistics and Probability 4 QH

MTH 3827 Seminar in Statistics 4 QH

MTH 3836 Seminar in Combinatorics 4 QH

The department offers an assortment of courses under the general heading "seminar"—MTH 3812 through MTH 3819. At the outset of each quarter, times for organizational meetings will be posted. Schedule and content are negotiated at these meetings. Students and faculty with interest in the specialty of the seminar are encouraged to attend the organizational meeting.

MTH 3841 Readings in Philosophy of Science and Mathematics

4 QH

MTH 3850 Doctoral Dissertation

0 QH

Students may take graduate courses in the College of Computer Science as required electives with permission of the student's adviser.

Physics

I. Introductory Courses

PHY 1432 Thermodynamics and Kinetic Theory **3 QH**

Includes first and second laws of thermodynamics; entropy and equilibrium; thermodynamic potentials; elementary kinetic theory; statistical mechanics; and the statistical interpretation of entropy.

PHY 1433 Introduction to Nuclear Physics **3 QH**

Includes nuclear structure; nuclear masses; radioactivity-nuclear radiation; radiation and matter; detectors; fission, nuclear forces; and elementary particles. *Prereq.* PHY 1303 or equiv.

PHY 1434 Introduction to Solid State Physics **3 QH**

Offers a semiclassical treatment of the thermal, magnetic, and electrical properties of crystalline solids. Includes X-ray diffraction and the reciprocal lattice; elasticity and lattice vibrations; specific heat; properties of insulators; magnetism in insulators and metals; and introduction to the band theory of metals. *Prereq.* PHY 1303 and PHY 1432 or equiv.

PHY 1435 Quantum Mechanics 1 **3 QH**

The first of a two-quarter sequence in quantum mechanics, focuses on observations of macroscopic and microscopic bodies, and the uncertainty principle—wave-particle duality; probability amplitudes; Schrodinger wave theory; and one-dimensional problems. *Prereq.* PHY 1303 or equiv.

PHY 1436 Quantum Mechanics 2 **3 QH**

Continues PHY 1435. Covers discrete and continuous states; Schrodinger equation in three dimensions; angular momentum; general theory of quantum mechanics; and applications. *Prereq.* PHY 1435.

PHY 3401 Radiation Physics **2 QH**

Introduces atomic and nuclear physics for graduate students in biology and pharmacy. Includes quantum mechanics and atomic structure, nuclear structure, radioactivity, properties of nuclear radiation, and detection of radiation.

PHY 3402 Radiation Biology **2 QH**

Covers the effects of radiation on biological systems and the uses of radiation in medicine and biological research. Includes effects of radiation on chemical reactions; effects of radiation on cells, organs, and individuals; theories of radiation damage and repair; imaging and tracer techniques using radiopharmaceuticals; and radiation safety and standards. *Prereq.* PHY 3401 or equiv.

PHY 3551, PHY 3552 Electronics for Scientists 1, 2 **4 QH**

PHY 3551 and PHY 3552 form a two-quarter sequence covering electronic techniques for experimental

research in many different fields of science. Topics include principles of semiconductor devices; analog techniques (amplification, feedback, integration), and digital techniques (counting, multiplexing, logic); design of electronic subsystems (analog-to-digital converters, phase-sensitive detectors, and data-logging systems); and understanding specifications of commercial electronic equipment. Lab examples make use of up-to-date integrated and discrete devices, such as are currently used in the electronic industry.

II. Elective Courses (Offered Every Year)

PHY 3557 Graduate Advanced Laboratory **4 QH**

Presents special projects in modern experimental physics, including electronic instrumentation used in measuring physical quantities and use of microprocessors. *Prereq.* PHY 3551 and PHY 3552 or permission of instructor.

PHY 3561 Graduate Project Laboratory **4 QH**

Allows students to select and carry out individual projects involving instrumentation and computation. Involves the development of some aspect of instrumentation and/or computation in an ongoing research project, and the preparation of a final report. The student will be supervised by the project leader and the course instructor. Although the course carries 4 QH, it is taken in successive winter and spring quarters. *Prereq.* Permission of instructor.

III. Required Regular Courses (Offered Every Year)

PHY 3606 Computational Physics **3 QH**

Studies FORTRAN, numerical analysis, and Monte Carlo methods. Topics include algebraic manipulation, minimization and maximization of functions, eigensystems, and types and uses of graphic displays in physics.

PHY 3607, PHY 3608, PHY 3609 Mathematical Methods and Classical Mechanics A, B, C **3 QH**

A three-quarter sequence dealing with mathematical methods of physics and classical mechanics. The two areas are intertwined with topics selected from the following areas. Mathematical methods covers differential equations, functions of a complex variable, linear vector spaces, Green's functions, calculus of variations, partial differential equations, integral equations, and introduction to group theory. Classical mechanics covers generalized coordinates,

variational principles in classical mechanics, Lagrange's equations, Hamilton's equations, symmetry and conservation laws, central forces, classical scattering theory, small oscillations, continuous systems and classical fields, and theory of special relativity.

PHY 3611, PHY 3612, PHY 3613 **3 QH each**
Electromagnetic Theory A, B, C

Analyzes Maxwell's equations in the vacuum and special relativity. Discusses the energy-momentum tensor in the context of radiation problems, including bremsstrahlung and synchrotron radiation. Covers cavity radiation problems (such as microwave). Treats electromagnetic properties of matter for a variety of situations: conductors, dielectrics, ferromagnets, and superconductors. Studies electrostatic and magnetostatic boundary value problems. May cover other applications, such as stopping power of matter for relativistic particles, plasma physics, and the interaction of electromagnetic radiation with gravity. *Prereq. PHY 1403, PHY 3601 concurrently.*

PHY 3621, PHY 3622, PHY 3623 **4 QH each**
Quantum Theory A, B, C

Explores experimental basis of quantum theory, Schrodinger equation and probability interpretation of wave mechanics, uncertainty principle, application to one-dimensional problems, the harmonic oscillator, orbital angular momentum, and the central force problem. Studies quantum theory of scattering, Born approximation, phase-shift analysis, introduction to S-matrix theory, general formulation of quantum mechanics in Hilbert space, spin, identical particles and symmetrization principle, time-independent and time-dependent perturbation theory, semiclassical theory of radiation and atomic spectra, addition of angular momentum, Wigner-Eckart theorem, quantum theory of radiation, and absorption, emission, and scattering of photons. *Prereq. PHY 1435 or equiv.*

PHY 3624 Advanced Quantum Theory **4 QH**

Introduces the formulation of a relativistic quantum theory, study of the Dirac equation and its Lorentz covariance, plane-wave solution of the Dirac equation, and projection operators. Covers bound-state solutions of the Dirac equation in a Coulomb field and the hydrogen atom. Considers parity, charge conjugation, time-reversal symmetries, and propagator theory. *Prereq. PHY 3623.*

PHY 3631 Statistical Physics A **3 QH**

Studies the phenomenological theory of thermodynamics, fundamental relations and thermodynamic potentials, extremal principles of thermodynamics, applications to simple systems, stability conditions, phase transitions, thermodynamics of electric and magnetic systems, and principles of irreversible thermodynamics. *Prereq. PHY 3603 and PHY 3621 concurrently.*

PHY 3632, PHY 3633 Statistical Physics B, C **3 QH each**

Explores the principles of statistical mechanics and statistical thermodynamics; density matrix; theory of ensembles; derivation of the laws of

thermodynamics; Fermi-Dirac and Bose-Einstein statistics, application to gases, liquids, and solids; theory of phase transitions; second-quantization formalism for interacting systems; and cooperative phenomena. *Prereq. PHY 3621 and PHY 3631.*

PHY 3641, PHY 3642 Solid State Physics **4 QH each**

Covers topics from Drude and Sommerfeld (or free electron) models of electrons in metals, crystal structure, one-electron states in crystal lattices, Bloch's Theorem, semiconductors and semi-conducting devices, effects of electron-electron interactions, lattice vibrations and the classical and quantum theories of specific heat, optical properties of solids, investigation of crystal structure and excited states of crystals by X-ray and neutron scattering, simple transport theory based on the Boltzmann equation, and magnetic properties of solids.

PHY 3651, PHY 3652 Particle and Nuclear Physics A, B **4 QH each**

Includes nuclear models, nuclear scattering and reactions, classification of particle interactions, internal symmetries, field theory, unification of weak and electromagnetic interactions, and gauge theories. *Prereq. PHY 3624.*

IV. Advanced Elective Courses

PHY 3643, PHY 3644, PHY 3645 Advanced Solid State Physics A, B, C **4 QH each**

Includes selected advanced topics in the theory of solids to be chosen each time by the interested students and instructor. Covers, for example, theory of normal metals, Hartree-Fock and Random phase approximations, optical and transport properties, solid state plasmas, Raman spectroscopy, quasiparticles and collective excitations, quantum solids, and amorphous solids. *Prereq. PHY 3633, PHY 3623, and PHY 3642.*

PHY 3653, PHY 3654, PHY 3655 Fields, Particles, and Strings A, B, C **4 QH each**

Introduces a local field theory. Considers symmetries of the Lagrangian and conservation laws; S-matrix and LSZ reduction formulae; perturbation theory; Feynman diagrams; spontaneous breaking and Higgs phenomenon; Glashow-Salam-Weinberg unified theory of electro-weak interactions. Briefly introduces Einstein theory of general relativity. Discusses developments leading to string theory: normal mode expansion; open and closed strings; deduction of D-10 for bosonic and D-10 for superstrings; scattering amplitudes in strings; Heterotic String; compactifications on the torus, orbifolds and Calabi-Yau manifolds; 4-D strings; and superstring phenomenology.

PHY 3661, PHY 3662, PHY 3663 Many-Body Theory A, B, C **4 QH each**

Introduces some many-body problems and the required mathematical techniques. Explores theory of linear response and correlation functions; Landau's theory of Fermi liquids and applications to solids; theory of superconductivity and superfluidity; and general theory of Green's functions and diagrammatic

techniques. *Prereq.* PHY 3623, PHY 3633, and PHY 3642.

PHY 3671 Foundation of General Relativity 4 QH

Discusses the physical basis underlying relativity (the weak and strong principle of equivalence), the role of the metric tensor as a carrier of gravitational information, and the modification of the Lorentz covariant field equations in the presence of gravitation. Introduces Riemannian geometry and discusses the Einstein field equations and tests of Einstein's theory. *Prereq.* PHY 3603, PHY 3613, PHY 3623, and PHY 3672.

PHY 3672 Relativistic Astrophysics and Cosmology 4 QH

Deals with the equations for the relativistic stellar system; white dwarfs, neutron stars, and properties of pulsars; gravitational collapse and black holes; quantum radiation from black holes; super heavy stars as possible quasar energy sources; quantum effect in gravitational collapse; the metric for cosmological systems; and the big bang theory. *Prereq.* PHY 3624 and PHY 3671.

PHY 3673 Quantum Gravity 4 QH

Deals with gravitation as a quantum field, threshold properties of gravitational quantum S-matrix, quantization leading to a set of Feynman rules, calculations of simple tree diagrams, closed loop infinities, and the problem of renormalizability of quantum gravity. *Prereq.* PHY 3672.

PHY 3798 Master's Thesis Continuation 0 QH

PHY 3799 Doctoral Dissertation Continuation 0 QH

PHY 3811, PHY 3812, PHY 3813 1 QH each
Reading Course

PHY 3821, PHY 3822, PHY 3823 2 QH each
Reading Course

PHY 3831, PHY 3832, PHY 3833 3 QH each
Reading Course

PHY 3841, PHY 3842, PHY 3843 4 QH each
Reading Course

Offers reading course, or theoretical or experimental work under individual faculty supervision. *Prereq.* *Permission of instructor.*

PHY 3890 Master's Thesis 1 4 QH

Student will start a master's thesis in a selected topic in experimental or theoretical physics. *Prereq.* *Permission of instructor.*

PHY 3891 Master's Thesis 2 4 QH

Offers continuation of master's thesis. *Prereq.* *At least a B grade in PHY 3890 and permission of instructor.*

PHY 3892 Master's Thesis 3 4 QH

Offers continuation and completion of master's thesis. Requires written thesis. *Prereq.* *At least a B grade in PHY 3891 and permission of instructor.*

PHY 3895 Doctoral Dissertation 0 QH

Offers experimental and theoretical work for PhD candidates.

Political Science

All courses carry three quarter-hours of credit unless otherwise specified. Most courses are seminars.

POL 3500 Scope and Methods of Political Science 4 QH

Examines the assumptions, principles, and so on, that underlie contemporary political science. Invites the student to consider the present practice of the discipline in the light of its history and to evaluate the discipline critically in the interest of a greater understanding of political science's nature and limits.

POL 3502 American Government and Politics

Analyzes the constitutional system and national government institutions focusing on the executive, legislative, and judicial branches. Examines political parties and pressure groups and their role in the policy process. MPA core course.

POL 3504 Political Psychology and Socialization

Examines theories of political psychology, opinion formation, and attitude change; political ideology; processes of individual political development and socialization; effects on mass and elite political behavior; attitudinal differences and differential socialization experiences; and individual political behavior and the political system.

POL 3506 Politics and the Mass Media

Studies the role of mass media in the formation of public opinion, with special attention given to media usage in the electoral process.

POL 3508 American Legislative Process

Studies Congress and the influence of the President, administrative bureaucracy, parties, interest groups, and public opinion on the development of legislative policy. MPA elective.

POL 3510 Theories of American Political Participation

Focuses on political behavior at both the national electorate level and at the level of legislative roll-call voting, analyzing the relative impact of demographic and attitudinal components as well as the effect of constituency and partisan identification upon legislative behavior.

POL 3512 American Constitutional Law 1

Employs excerpts of United States Supreme Court decisions and other primary legal materials to examine the constitutional rationale for judicial review; various philosophical approaches to the exercise of judicial power; and the scope of judicial authority to settle

questions challenging the legitimacy of governmental actions in the American constitutional system.

POL 3514 American Constitutional Law 2

Uses excerpts of primary legal materials to build upon the judicial doctrines developed in POL 3512 and specifically examine the constitutional theories behind the growth of congressional prerogatives in economic and social affairs and expanding presidential power in internal and foreign matters. *Prereq.* POL 3512 or permission of the instructor.

POL 3516 The Presidency

Analyzes the development of constitutional and extra-constitutional presidential power, examining the role of the president in formulating and executing domestic and foreign policy.

POL 3518 American Electoral Behavior

Considers the theoretical and methodological assumptions of election studies of the American political system and reviews the substantive conclusions.

POL 3519 Campaigns and Elections

Studies campaign tactics and strategies. Fieldwork required.

POL 3520 The Judiciary

Studies the judicial process in the United States, emphasizing federal courts. Focuses on theories and empirical research regarding judicial decisionmaking, how and why judges decide what they do, and with what political effects.

POL 3522 Political Parties

Focuses on American political parties, including such aspects as organization, nominations and party reform, elections, voting behavior, and state and national political trends.

POL 3523 Interest Groups

Surveys the role of interest groups in American politics, with emphasis on distinctions between traditional economic interests, newer types of social forces, and public interest organizations.

POL 3524 Civil Rights

Examines the doctrine of constitutionalism, illustrated and amplified by a study of the substance and process of the Bill of Rights as developed in decisions of federal courts, and congressional enactments.

POL 3526 Procedural Due Process

Examines the United States Supreme Court's treatment of the doctrine "due process of law." Focuses on the nationalization of the Bill of Rights and the constitutional guarantees of process in administrative settings.

POL 3531 Models of Political Systems

Examines the detail and critiques current models of political systems.

POL 3533 Crisis and Change in Eastern Europe

Analyzes the decommunization and desatellitization of former Soviet Bloc countries and the prospects for stable political development and successful economic growth in the post-communist era.

Considers briefly crisis and change in Yugoslavia and Albania.

POL 3535 Parliamentary Democracy in Western Europe

Compares environment, vehicles of popular participation, and formal structures and reach of government in the parliamentary democracies of western Europe. Gives special attention to England, France, and Germany.

POL 3537 Crisis and Change in the Soviet Union

Offers intensive study in crisis and change in the Soviet political system since Brezhnev, focusing on the causes, character, and consequences of the Gorbachev reform program.

POL 3539 European Political Parties

Examines by comparative cross-national study political organization and behavior in England, France, and Germany with emphasis on party leadership, strategy, organization, and constituency as well as socialization, recruitment, and participation of voters.

POL 3541 European Legislative Systems

Compares the legislatures in Britain, France, and Germany with emphasis on patterns of historical development, functions, internal organizations, and relations with the executive.

POL 3543 European National Executives

Examines by comparative cross-national study executive decision making in England, France, and Germany with emphasis on varying patterns of presidential and cabinet authority as well as relationships with the legislature.

POL 3545 Government and Politics of the Middle East

Examines the political and economic structures of the Arab states and Israel as well as inter-Arab politics and inter-state conflict in the area.

POL 3547 Government and Politics of North Africa and the Middle East

Compares the political systems and foreign policies of African states north of the Sahara. Stresses the relationship of this area with the Middle East.

POL 3550 Government and Politics of Great Britain and Northern Ireland

Analyzes government organization and political behavior in the United Kingdom. Pays special attention to executive-legislative relations, the political party system, and the politics of Northern Ireland.

POL 3551 Seminar in International Relations

Analyzes the major actors, their goals, and the means and strategies they utilize within the international system.

POL 3552 International Political Economy

Explores new directions in the field of international political economy. Stresses approaches to and trends within the field, such as the intellectual and theoretical roots of international political economy; the management of collective goods; relations between advanced industrial states; relations between advanced industrial and less industrial states; and relations between nonstate and state actors.

POL 3553 Government and Politics of Germany

Studies political culture, federalism, and executive-legislative relations on the national level with a view to appraising the quality and durability of the current democratic system.

POL 3554 Government and Politics of France

Studies current governmental organization and political behavior in France. Pays special attention to the role of the presidency, executive-legislative relations, and the political party system.

POL 3555 International Organization

Focuses on issues of international political economy. Emphasizes the role of various international organizations in managing economic interdependence and the role of international administrators in the United Nations' search for a new international economic order. Discusses nongovernmental organizations, such as multinational corporations.

POL 3557 Soviet-Chinese Relations

Presents a chronological and topical analysis of the Soviet-Chinese relationship since 1950 with special attention to the causes of rivalry and conflict in the 1960s and 1970s, and to reconciliation in the Gorbachev era.

POL 3558 Asia and the Politics of Development

Relates the theoretical literature on political development to the concrete attempts to develop in Asia. Encourages each student to concentrate on one state and explore different ideas about political development as they relate to that state because of the diversity in levels and types of political development in Asian states. MPA elective.

POL 3559 Governments and Politics of Latin America

Investigates contemporary Latin American politics, emphasizing formal political institutions, such as electoral rules, and informal political process, such as patron-client networks, under alternative national political "games," including traditional authoritarianism, populism, modernizing military rule, the postrevolutionary regime, and elite or mass democracy. Focuses on Mexico, Cuba, and the larger countries of South America.

POL 3560 Politics of the Developing Nations

Considers the process of political development in the third world, including both internal and international issues such as leadership patterns, the role of the military and political parties, and underlying economic and social factors. MPA elective.

POL 3561 Great Powers and the Middle East

Analyzes the changing nature of great power and multinational involvement in the Middle East.

POL 3562 United States-Soviet Relations

Studies security, trade, and political issues in United States-Soviet relations since 1985. Focuses on both Washington's and Moscow's emphases on compromise, cooperation, and conflict resolution.

POL 3563 United States-Far Eastern Relations

Analyzes American diplomacy in the Far East, with primary concentration on relations since World War II with Japan, China, and Southeast Asia.

POL 3564 China's Foreign Policy

Examines major principles in China's foreign relations. Explores how socialist ideology; domestic politics; nationalism; and the need to participate in the international economic system for the purpose of trade, investment, and technology transfer affect China's foreign policy. Looks at China's changed relationships with the United States, the Soviet Union, Japan, Western Europe, the newly industrialized countries of Asia, and the third world. Focuses on how the passing of communism in all but a few countries affects China's foreign policy. Examines the Peoples Republic of China's role in the United Nations, and its relations with Taiwan and Hong Kong.

POL 3565 Soviet Relations with Eastern Europe

Analyzes historic and current Soviet policy toward Eastern Europe. Focuses on how and why the Kremlin allowed Communist party regimes to disappear in 1989 as well as on the long-term impact of the Soviet Union's loss of power in the region.

POL 3566 Chinese Politics

Examines the interaction between ideology, development, and culture on the major issues in Chinese politics since the Communist Party took control in 1949. Issues include leadership recruitment and succession, economic development, class and class struggle, political culture, education, socialist democracy, socialist legality, and the evolving definition of socialism in the context of Chinese culture.

POL 3567 Japanese Politics and Foreign Policy

Examines the development of Japan's political system since World War II. Focuses on Japan's institutions and democratic practices in the context of political culture. Explores the interrelationship between business and government, Japan's foreign policy and international trade practices, and business practices and organization. Raises issues concerning Japan's extraordinary economic success and Japan's limitations as a model for other countries.

POL 3568 Sub-Saharan African Politics

Compares the political systems and foreign policies of selected African states south of the Sahara. Focuses on the Republic of South Africa and its policy of apartheid.

POL 3569 Decision Making in United States Foreign Policy

Comprehensive analysis of the governmental mechanism and process for foreign policy decision making in the United States. Emphasizes case studies in decision making.

POL 3570 United States Foreign Policy

Examines in depth selected issues concerning the role of the United States in world affairs since 1945.

POL 3571 Ethnic Political Violence

Analyzes ethnic political violence from an international perspective. Undertakes in-depth analysis of

the Northern Ireland case, with reference to other key international examples. Focuses upon causes of ethnic political violence as well as potential remedies.

POL 3572 Problems of World Order 1

Emphasizes such topics as appraisal of diverse systems of public order, approaches of international law and international organization to the problem of world order, and the problem of world peace enforcement.

POL 3573 Problems of World Order 2

Stresses political problems of world order. Includes arms control and disarmament, the limits of economic growth, international political economy, population problems, and resource distribution.

POL 3574 United States National Security Policy

Deals with United States national security policy in the post-World War II era. Focuses on the evolution of United States nuclear and conventional strategy and arms control efforts. Considers future military and arms control options.

POL 3575 Arab-Israeli Dispute

The Arab-Israeli confrontation has its own dynamics and a character that has changed through the decades. Students analyze the conflict's interaction with the internal politics of the Arab states and Israel, pan-Arab politics, and the role of the great powers in the region.

POL 3576 War in International Perspective

Analyzes the causes of war as well as policies for the prevention of war. Considers the changing technologies and strategies of war from both a historical and contemporary perspective. Considers specific past and present wars from an international perspective.

POL 3578 Soviet Foreign Policy

Studies Soviet foreign policy since 1964. Discusses détente in relations with the United States; polycentrism in East Europe; involvements and commitments in the Middle East and Africa; and the dispute with China.

POL 3580 The United Nations

Analyzes selected topics on the nonpolitical work of the United Nations: human rights; economic, social, health, and related problems; and decolonization and the trusteeship system.

POL 3581 International Peacekeeping

4 QH

Investigates the origins, history, and theory of interventionary peacekeeping, with reference to the documentation of the United Nations. Explores an assessment of this method of maintaining regional stability and a projection of potential means of developing the method to broader applicability.

POL 3583 International Law

Examines selected topics in international law not covered in POL 3572 and POL 3573.

POL 3584 Regional Organizations

Studies regional organizations, such as EEC or OAU, to determine the capability of such organizations

to promote economic development and political influence.

POL 3585 The Atlantic Community

Analyzes European-American diplomacy with particular emphasis on security and economic matters. Considers the integration of Europe, American responses, and the results of these interactions for world political and economic stability.

POL 3586 Nationalism

Studies the evolution and role of nationalism in both theory and practice. Analyzes representative nationalistic movements and theories.

POL 3587 Politics of Revolution and Change

Analyzes the nature of political change with attention to both theory and practice. Discusses revolution, major trends in contemporary politics, and the relationship between political change and technological, scientific, or social change.

POL 3589 Terrorism, Violence, and Politics

Analyzes the theory and practice of terror, violence, coercion, force, and threats in political life.

POL 3590 Crisis Politics in Democracies and Dictatorships

Analyzes governmental response to crises and emergencies. Considers such topics as war powers, riot and rebellions, martial law, transfer of regime, succession problems, economic crises, presidential emergency powers, national security powers, executive privilege, and impeachment.

POL 3591 Totalitarianism and After

Analyzes totalitarianism and dictatorship, including study of historical background, fundamental characteristics; theories of origin, nature, and significance; and evaluation of techniques, ideologies, policies, and instruments of power. Emphasizes the government and politics of the Soviet Union.

POL 3593 Ancient and Medieval Political Thought

Focuses on the development of political thought from Greek antiquity to the end of the Middle Ages, utilizing both historical and analytical approaches. Considers the cultural, social, and intellectual context within which political theories develop.

POL 3594 Modern Political Thought

Examines political thought from Machiavelli to Marx.

POL 3595 Contemporary Political Theory

Explores the main currents of political thought in the latter half of the nineteenth and the twentieth centuries with special emphasis on the relations between political theory philosophy and political science.

POL 3596 Marxism

Examines the theory and practice of Marxism, including its background and origins, and its subsequent development.

POL 3597 Trends in American Political Thought

Examines intellectual concepts and movements that have informed and influenced American political life, with emphasis upon those relating to the making and execution of public policy. MPA elective.

POL 3600 Introduction to Public Administration

Introduces literature and the major topics in public administration with special attention given to the interrelationships of politics and administration. MPA core course.

POL 3601 Public Personnel Administration

Introduces students to the public personnel function from a managerial standpoint. Addresses methods of constructive leadership of government personnel, leadership that encourages a more competent, motivated, and representative, public administrative workforce. Employs case studies and films, along with assigned readings. MPA core course.

POL 3602 Organization Theory and Management

Examines the general principles underlying organizational structures and processes. Topics include models and ideal types, open systems theories, organizational technologies, decision making, and organizational development and change. MPA core course.

POL 3603 Public Budgeting

Surveys governmental budgeting at the federal, state, and local levels. Surveys major revenue sources and expenditure responsibilities. Discusses budgetary processes and politics, as well as resulting policies. Considers both proposed and implemented reforms. MPA core course.

POL 3604 Techniques of Policy Analysis

Provides a systematic approach to understanding the origins, formulation, implementation, and impact of government. Reviews key analytical concepts and competing theoretical perspectives. Considers both the political dimensions of public policymaking and the technical aspects of program design within the natural history of the policy-making process. Draws on case materials from a spectrum of policy areas. MPA core course.

POL 3605 Quantitative Techniques 1

Introduces quantitative methods. Emphasizes descriptive statistics, inference, and cross-tabulation analysis. Includes initial uses for computers and programming techniques. MPA core course.

POL 3606 Quantitative Techniques 2

Presents quantitative methods, emphasizing techniques and applications of value to public sector analysts. Includes hypothesis testing, bivariate regression and correlation, and multiple regression. Examines how to generate and interpret statistical analyses through use of SPSS program. MPA core course. *Prereq.* POL 3605.

POL 3607 Computer Applications

Introduces the basics of computer applications for public administrators, concentrating on the use of personal computers. Topics include spreadsheets, graphics, database management, management information systems, and word processing. MPA core course.

POL 3608 Public and Nonprofit Financial Management

Introduces financial management practices. Considers theoretical questions of how to define public interest and what constitutes a legitimate public expenditure. Explores topics such as cash management, risk management, fund accounting, debt financing, endowment spending and control, cost allocation procedures, and tax expenditures. MPA core course.

POL 3610 Methods of Economic Analysis for Public Administrators

Introduces a construct of public economy as a means for focusing on contemporary economic issues facing public administrators. Serves as a prerequisite for students lacking economic course work at the baccalaureate level. MPA core course.

POL 3611 Intergovernmental Relations

Offers an institutional-behavioral analysis of the changing relationship among the various levels of American government—national, state, and local—relating the pattern of change to the social and economic forces that underlie it. MPA elective.

POL 3613 Constitutional Law in Public Administration

Introduces American constitutional law and the federal system using case materials and emphasizing principles of importance to public administrators, including such constitutional concepts as separation of powers, judicial review, dual federalism, legislative investigating power, executive impoundment, federal preemption, and the appointment and removal power. MPA elective.

POL 3614 Administrative Ethics in Public Management

Analyzes ethical problems in American public administration including discussion of ethical dilemmas frequently faced by public managers. MPA elective.

POL 3615 Development Administration

Takes a "manager's-eye view" of the formulation, implementation, evaluation and improvement of development projects in less developed countries. Includes integrated rural development, community participation, lower- and middle-level management decentralization, and management training. Development Administration concentration requirement. MPA elective.

POL 3616 State Government

Appraises the problems of contemporary state government in the United States. Emphasizes the state government of Massachusetts. Stresses individual research. MPA elective.

POL 3618 Urban and Regional Planning

Examines the role of government and politics in creating and implementing urban and regional plans. Emphasizes developing and applying zoning laws, growth controls, and other land-use strategies designed to shape urban and regional communities. MPA elective.

POL 3622 Urban Government

Explores problems in urban government such as political independence, government finance and administration, rapid growth of suburban and

metropolitan areas, and decline and decay of the core city. Emphasizes the Boston metropolitan area. Stresses individual research. MPA elective.

POL 3625 Collective Bargaining and Labor Relations in the Public Sector

Studies labor relations in public enterprises, with special emphasis on the role of public employee unions and collective bargaining. Emphasizes labor relations in the public sector (including employee rights and legal issues) and the history, theory, techniques, and impacts of public employee unionism and collective bargaining. MPA elective.

POL 3630 Health Administration

Introduces administration in hospitals and other health care organizations. Topics include financial management, quality and utilization control, strategic planning, marketing, personnel management, and information systems. Health Administration and Policy concentration requirement. MPA elective.

POL 3631 Urban and Community Development

Helps students analyze urban development issues and learn how to be effective in creating and implementing public development policy and programs. Explores subsidies and taxes, housing, commercial and industrial development, and job creation and training projects in terms of their historical, political, economic, and social dimensions. MPA elective.

POL 3632 Public Fiscal Management

Studies the interrelationships in public administration between systems of finance and the achievement of program objectives. Stresses aspects of the budgetary process that bear on fiscal policy and appropriations. MPA elective.

POL 3634 Functions and Techniques of Public Management

Provides an introduction to problems in public management and techniques for dealing with them including functions of middle management, supervision, administration of staff activities (for example, planning, personnel, budget), organization and methods, public relations, managerial use of computer-based techniques, and tactics and strategies of management. MPA elective.

POL 3637 Comparative Public Administration

Compares approaches to public administration in selected democratic governments in the United States and Europe. MPA elective.

POL 3638 Marketing for Public Managers

Introduces present and future public managers to traditional marketing concepts and analyzes how using these concepts can create effective public programs. MPA elective.

POL 3639 Federal Administrative Law

Studies rule making, adjudication (formal and informal), administrative finality and judicial review, administrative procedure, scope of administrative powers, and enforcement techniques. MPA elective.

POL 3640 Governmental Accounting

Examines principles and procedures involved in governmental accounting. MPA elective.

POL 3641 Techniques of Program Evaluation

Reviews methodologies for assessing the impact of public policy. Includes experimental and quasi-experimental research design, the value and limits of case studies, political and organizational barriers to evaluation research, report writing, and procedures for instituting change. MPA elective.

POL 3642 Management Planning and Decision Making

Reviews the growth of the planning approach to public management and of its application in specific agencies. Includes organization of the management planning function, budget planning, and methods of providing planning forecasts. MPA elective.

POL 3643 Organizational Psychology and Behavior

Examines the literature, theories, and concepts of administrative behavior as it has evolved with emphasis on the development of self-awareness and the building of interpersonal skills. MPA elective.

POL 3645 Program Implementation

Examines the implementation of policy, including the intergovernmental fiscal context, implementation capacity, the politics of implementation, and public-private and interbureaucratic coordination issues. MPA elective.

POL 3648 Legal Topics for Health Administration

Provides an overview of legal issues and topics relevant to health administration, including malpractice, accreditation, and affiliations. Health Administration and Policy concentration requirement. MPA elective.

POL 3649 Regulatory Administration

Offers the public manager a conceptual and historical overview of the development of regulatory policy and mechanisms, focusing on issues at the public-private interface as well as evaluating the practical implications of government intervention. Evaluates the political, economic, and administrative effects of a nonregulatory versus regulatory approach to public management. MPA elective.

POL 3650 Group Dynamics

Focuses on the human problems public managers face in their daily work based upon an introductory understanding of organizational psychology and behavior. Using a group dynamics format, provides the opportunity to integrate the literature in organizational psychology, work issues, and personal growth concerns. MPA elective.

POL 3652 Civil Liberties in Public Administration

Discusses First Amendment rights as they impact upon the public sector. Referring to appropriate court cases, includes employee rights and obligations with respect to freedom of speech, freedom of association, loyalty oaths, and professional certification, as well as legislative powers. MPA elective.

POL 3653 Survey Research for Public Administration

Covers the survey research process, including questionnaire design, sample selection, interviewing, computerizing data, and analysis. Discusses administrative applications of survey research. MPA elective.

POL 3655 Politics and Administration in Cities and Towns

Examines the political and administrative structures that influence the conduct of city and town governments. Emphasizes dynamic relationships between these structures and the implications for public policymaking. MPA elective.

POL 3656 Business/Government Relations

Extensively examines the relationship between the United States government and the private economy from an historical and a contemporary perspective. Analyzes a number of public policy areas in which public and private actors interact. Examines stabilization policy, regulation, antitrust, and social welfare policy in the context of alternative interpretations of the United States political economy. MPA elective.

POL 3657 Organizational Analysis

Studies the structure and processes of organization essential for problem solving and for effecting organizational change. Emphasizes the application of social science theory and administrative principles in administrative problem identification and problem resolution. MPA elective.

POL 3658 State Budgeting

Explores state budget development and execution. Discusses relevant political actors, processes, and policies relating to state revenue and expenditure decisions. Analyzes state budgeting in a federal system and in a comparative context. MPA elective.

POL 3659 Municipal Finance

Discusses the special problems of budgeting and finance in local governments, including budget preparation and presentation, debt management, capital financing, and local taxation policy. MPA elective.

POL 3660 Development Planning

Focuses on the dynamics and activities of host-government, bilateral, and multilateral organizations as they analyze and tackle such problem areas as agriculture, education, health, population, and land reform in developing countries. Stresses the special role of public administration in less developed countries. Development Administration concentration requirement. MPA elective.

POL 3662 Comparative Urban Government and Administration

Analyzes decision-making structures and processes in selected urban areas, including an examination of world organization trends and implications for administration and politics of cities; changing scopes, scale, participants, and organization of urban politics; and selected issues such as urban housing finance, leadership, planning, and goals. MPA elective.

POL 3667 Equal Opportunity in Public Administration

Examines barriers to EEO; helps students develop an awareness of issues surrounding the Affirmative

Action Program and particularly some of the historical perspectives of discrimination against minorities and women; and offers instruction in techniques for developing a meaningful equal opportunity program for public organizations. MPA elective.

POL 3668 Legal Issues in Public Personnel Administration

Reviews and discusses fact situations and evidence that give rise to public employment litigation with emphasis on civil rights and Equal Employment Opportunities court actions. Discusses the type of evidence used in litigation and the types of defenses available to public employers. MPA elective.

POL 3670 Public Relations in Public Administration

Focuses on evaluating the public manager's role in the process of communication with the public. Evaluates issues of imagery and accountability as well as current topics. MPA elective.

POL 3672 Policy Issues and Administration in Mental Health Care

Analyzes policymaking and administration within the contemporary mental health system, with a special focus on the process and impacts of deinstitutionalization. MPA elective.

POL 3674 Intergovernmental Fiscal Relations in the United States

Explores the relationships between the local and state levels of government in the assessment and collection of taxes, budgeting, debt management, and state aid. Evaluates the federal role and fiscal intergovernmental relations. MPA elective.

POL 3675 Health Policy and Politics

Introduces contemporary health care policies, programs, and politics. Discusses the current crisis in health care costs, with proposed solutions such as health planning, certificate-of-need regulation, and different health insurance reimbursement mechanisms. Health Administration and Policy concentration requirement. MPA elective.

POL 3677 Elder Services Policy and Administration

Investigates the historical, socioeconomic, and philosophical determinants of the elder services system. Studies current policies and programs using case studies, dynamic models, and comparative analysis. MPA elective.

POL 3678 Federal Bureaucracy

Examines dynamic and structural aspects of the national government, with attention to the place of the national administration in the federal system. MPA elective.

POL 3679 Contemporary Issues in Third World Development

Examines the major themes in development studies today. Explores approaches to development and modernization, dependency theory, food aid and production, population growth, equity and poverty, rural and urban development, health and nutrition, education, and the international context of development assistance. Students considering a development administration concentration should try to take this course as

their first in the field of development. Development Administration concentration requirement. MPA elective.

POL 3690 Topical Seminar 1

Examines current issues in public administration. Possible seminar topics include transportation, environment, energy, housing, and social services.

POL 3691 Topical Seminar 2

Examines current issues in public administration. Topics may include transportation, environment, energy, housing, and social services.

POL 3696 Issues in Public Finance

Examines current issues in public-sector finance. Emphasizes policy alternatives and political realities.

POL 3697 Seminar in Public Personnel Administration

Analyzes specific topics and issues in public personnel administration to present material of current interest and allowing in-depth research into specified areas where appropriate. Subject matter to be covered is described in registration materials. MPA elective.

POL 3699 Seminar in State and Urban Administration

Analyzes specified topics and issues in state and urban administration with the purpose of presenting material of current interest and allowing in-depth research into specified areas where appropriate. Subject matter to be covered is described in registration materials. MPA elective.

POL 3798 Master's Thesis Continuation 0 QH

POL 3884 Assigned Reading 1 QH
Offers assigned reading under the supervision of a faculty member.

POL 3886 Assigned Reading
Offers assigned reading under the supervision of a faculty member.

POL 3890 Assigned Reading 6 QH
Offers assigned reading under the supervision of a faculty member.

POL 3891 Internship
Offers work experience (at least 15 hours per week) that includes planning, research, policy development, and other administrative aspects in a government or nonprofit organization.

POL 3892 Internship Readings and Analysis 6 QH
Offers study directly related to an internship assignment.

POL 3895 Thesis 6 QH
Offers thesis supervision by individual members of the department.

POL 3896 Thesis 9 QH
Offers thesis supervision by individual members of the department.

Psychology

All courses carry three quarter-hours of credit unless otherwise specified.

PSY 3013 Learning, PSY 3014 Neuropsychology 1, PSY 3015 Neuropsychology 2, PSY 3016 Language, PSY 3017 Cognition, PSY 3018 Perception, PSY 3019 Sensation, PSY 3020 Personality, PSY 3021 Social Psychology Proseminar

Serves as first-level graduate courses. Includes faculty lectures, student presentations, and discussions of important theoretical, experimental, and methodological approaches to the understanding and explanation of behavior and the mental processes underlying behavior. Emphasizes language and cognition; learning motivation and behavior analysis; behavioral neuroscience; sensation and perception; and social/personality.

PSY 3111, PSY 3211, PSY 3311 Quantitative Methods 1, 2, 3

Surveys the quantitative methods used in experimental psychology, emphasizing applications of computer programming, theory of functions and relations, curve fitting, probability functions, set theory, and analysis of variance.

PSY 3119, PSY 3219, PSY 3319 Attention 1, 2, 3

Considers the topic of attention (selective and general, for example, arousal, and attentiveness). Dis-

cusses behavioral, cognitive, and physiological aspects.

PSY 3153 Seminar in Comparative Psychology

Focuses on studies of interspecies differences and similarities used in investigating several research topics: intelligence and learning, social communication, social development, and comparative cognition/cognitive ethology. Requires a brief field study using traditional ethological recording techniques (at the Franklin Park Zoo or the Fens) which will be presented to the class.

PSY 3191 Heredity and Society

Critically examines behavior-genetic research, its social-historical setting, methods, and substantive conclusions. Begins with research on the genetics of intelligence and continues on to the genetics of psychopathology and, depending on class interest, such areas as criminality, alcoholism, and obesity.

PSY 3449 Current Issues in Experimental Psychology

Discusses current theoretical and methodological issues in selected areas of experimental psychology.

Experimental Personality and Social Psychology

PSY 3171, PSY 3271 Psychopathology 1, 2 4 QH each

Considers the major forms of psychopathology, including the neuroses (obsessional states, hysteria, anxiety states, phobias), the psychoses (schizophrenia, mania, depression, paranoia), psychosomatics, sociopathy, conduct disorders, organic disorders, and mental retardation.

PSY 3172 Abnormal Psychology

Considers the symptomatology and etiology of the major forms of psychopathology in detail. Includes anxiety disorders, somatoform and dissociated disorders, schizophrenia, mood disorders, borderline disorders, and sociopathy.

PSY 3371, PSY 3372, PSY 3373 Social Psychology 1, 2, 3

Surveys theory and research in social psychology. Covers attitude and attitude change, aggression, altruism, group processes, person perception, and social cognition.

PSY 3477, PSY 3577 Personality Theory and Research 1, 2

Surveys representative theoretical formulations of the normal personality and its development, and examines experimental evidence bearing upon relevant concepts and assumptions (anxiety, repression, aggression, cognitive styles).

Language and Cognition

PSY 3126 Child Language Development

Contrasts learning theory approaches to language acquisition with psycholinguistic and neurogenic theories. Analyzes works of Skinner and Chomsky, and discusses implications for both normal and abnormal language development.

PSY 3161, PSY 3261 Cognition and Psycholinguistics 1, 2

Offers research in cognition and psycholinguistics.

PSY 3166 Psycholinguistics

Provides in-depth analysis of research methods and findings in selected problems in the psychology of language, including developmental, anthropological, and experimental psycholinguistics.

PSY 3167 Topics in Cognitive Development

Presents different theories of cognitive development. Possible issues include: the implications of stage theories; the relationship between cognitive development in a person and theory change in science; the difference between knowledge acquisition in childhood and in adulthood; the nature of the mind at birth; whether there are any alternatives to theories postulating stages or simple knowledge accumulation; and the role of constraints in development.

PSY 3264 Language Acquisition

Present an overview of issues in language acquisition that will be integrated with in-depth discussions of selected topics.

Learning and Behavioral Analysis

PSY 3121 Experimental Design in Applied Research

Studies in detail of experimental methods, emphasizing critical analysis of published research reports and the implementation of the methods in service settings. Provides the opportunity to learn and evaluate observational measurement and data-collection techniques. Requires a feasible experimental design, with graphed actual or hypothetical data, that must be written in the form of a scientific report.

PSY 3122, PSY 3222, PSY 3322, PSY 3422, PSY 3522 Applied Programming Seminar 1, 2, 3, 4, 5

Allows students to design, test, and evaluate instructional programs for teaching specific subject matter for remedial application to behavior problems and to test instructional theory. Provides supervision through a weekly programming research and data seminar in collaboration with the student's adviser.

PSY 3123 Programmed Learning

Reviews the history and theoretical and experimental bases of programmed instruction and errorless learning. Emphasizes the detailed analysis of stimulus control—its measurement, and ways to produce it.

PSY 3129 Mental Retardation Seminar

Provides an interdisciplinary seminar taught by faculty from the several Boston-area universities associated with the University-affiliated facility. Defines the role of each discipline in the care and treatment of retarded people and coordinates with the functions of other relevant disciplines. Includes specialties of communication disorders (Emerson College), dentistry (Tufts University), medical disciplines (e.g., pediatrics, neurology, orthopedics, genetics—Massachusetts General Hospital, Harvard Medical School), nursing (Boston University), nutrition (Framingham Teacher's College), occupational therapy and physical therapy (Sargent College of Boston University), social work (Boston University and Simmons College), sociology (Brandeis University), special education (Boston University), and psychology (Northeastern University).

PSY 3132, PSY 3232 Behavior Intervention 1, 2

Focuses on behavioral intervention techniques. Emphasizes the functional analysis of behavior.

PSY 3133, PSY 3233, PSY 3333

Advanced Learning Seminars 1, 2, 3

Covers contemporary research in operant conditioning, with emphasis on relating the techniques of behavioral analysis to problems of reinforcement, motivation, comparative psychophysics, and physiological psychology.

PSY 3143, PSY 3243 Learning Principles and Applications 1, 2

Analyzes principles from behavioral learning research and their application to the process of behavior change for learning, remediation, and treatment. Stresses educational settings.

4 QH

PSY 3229 Administration of Mental Retardation Services

Presents comprehensive overview of general and specialized services for retarded individuals from organizational and administrative points of view. Considers issues in planning and initiating new programs, service delivery, staffing, and economics. Includes visits to varied types of facilities to focus on administrative concerns.

PSY 3321, PSY 3421 Systematic Inquiry in Applied Research 1, 2

Requires each student to collect a comprehensive bibliography on a significant topic in applied behavior research and complete a thorough review via written and oral presentations. Emphasizes the integration and analysis of experimental findings and theoretical foundations of the research area, the critical evaluation of current research, and the definition of potentially fruitful future work.

PSY 3324 Behavior Change in Institutions

Review successful projects that have been carried out to provide effective remediation and rehabilitation in institutions for the mentally retarded, the juvenile delinquent, and the developing individual (schools).

PSY 3336 Memory

Provides a seminar covering theoretical, experimental and methodological issues relevant to the study of remembering and forgetting.

PSY 3649 Community Based Treatment

Focuses on the treatment of mentally retarded individuals in a community setting.

Psychobiology

PSY 3127, PSY 3128 Neurological and Sensory Impairments Seminars 1, 2

Analyzes etiology, assessment, and diagnosis, clinical characteristics, and education of the mentally retarded with visual, hearing, and motor deficits. In addition to discussion, provides experiences in evaluation and remedial programming, via the application of operant techniques.

PSY 3145 Human Neuropsychology 1**4 QH**

Addresses brain function and structure. Relates specific disorders seen in the clinical population to disfunction of the nervous system.

PSY 3151 Brain and Behavior 1

Introduces basic methods of physiological psychology, including animal surgery, electrical stimulation of the brain, electrophysiological recording, and histological techniques. Presents the opportunity to gain experience in these methods by carrying out a limited research project during the semester. Enrollment limited to ten. *Prereq.* Admission to doctoral candidacy or permission of instructor.

PSY 3155, PSY 3255 Sensory Psychophysiology 1, 2

Concentrates on the anatomy and physiology of the various sensory systems and correlation of these data with psychophysical and perceptual concepts. Includes lab work.

PSY 3158 Psychobiology of Reward Processes

Examines the brain mechanism psychobiology of reward or reinforcement processes, focusing heavily on the psychophysical method in brain stimulation reward. Studies how behavior can be used to measure refractory periods, latent potential summation, conduction velocity, and other properties of the directly excited neural tissue. Compares various reward measurement paradigms in regard to pharmacology studies and self-stimulation-associated phenomena such as priming or stimulation-induced feeding. Discusses other rewards, including stimulant drug self-administration and food reward.

PSY 3159 Neurochemistry and Behavior

Examines different experimental approaches to the problems involved in uncovering the relationships between changes in brain activity and changes in behavior produced by drugs. Discusses current theorizing on the role of early experience, environmental factors, biological rhythms, and other facets in the determination of drug-induced behavioral changes.

PSY 3225 Biological Bases of Mental Retardation

Considers the relationship between biological malfunction of the brain in particular, and the defective learning ability and other behavioral abnormalities which constitute mental retardation. Aims toward as comprehensive a survey as time permits. Includes actual case presentations as illustrative examples.

PSY 3251 Brain and Behavior 2

Presents selected topics in the neurophysiology of perception, emotion, motivation, learning, and memory, with emphasis upon a critical evaluation of recent literature. Enrollment limited to fifteen. *Prereq.* Admission to doctoral candidacy or permission of instructor.

PSY 3265 Human Functional Neuroanatomy

Studies the neuroanatomy of the human brain through the direct inspection of human brain tissue in a laboratory style format. Considers functional considerations as a consequence of anatomical structure. Requires considerable independent study with the specimens and text. Requires students to be responsible for memorizing anatomical details as well as understand broad principles of brain organization, development, and action. Also presents clinical manifestations of brain damage.

PSY 3295 Special Topics in Behavioral Neuroscience

In recent times considerable published work has appeared on the topic of computation in both model and real neuronal networks. The fundamental (and old) idea is to understand brain function by examining how its elements perform calculations. This seminar is intended to introduce students in the behavioral sciences to selected topics in computational neuroscience. Topics will be selected on the criteria of recent publication in an area of sustained advancement and will include computation models in vision, audition, the control of movement, and learning. To maintain the introductory spirit, the seminar will begin with a tutorial on the physiology of neurons,

synaptic transmission, and computation in simple nerve nets (two and three elements).

PSY 3355, PSY 3455, PSY 3555 Physiological and Comparative Psychology 1, 2, 3

Present seminars on a shared background; key concepts, and central issues in the field of physiological and comparative psychology.

Sensation and Perception

PSY 3188, PSY 3288, PSY 3388 Vision 1, 2, 3

Provides seminars in classical and modern problems in vision. Presents recent journal articles as primary source materials for discussion. Considers problems of stimulus specification, retinal structure, photochemistry, and psychophysical measures of sensitivity, color vision, and electrophysiology.

PSY 3189 Psychoacoustics

Deals with the relationship between sound and auditory perception. After five tutorial sessions on the physics and laboratory generation of sound, thresholds, masking, loudness, pitch, and sound localization, requires students to lead discussions based on research papers in the psychoacoustic literature.

PSY 3289 Perception

Considers in-detail research in such areas as form, space, and pattern perception, recognition, and the effects of set and motivation on perception. Considers physiological concomitants of perceptual phenomena.

Special Topics

PSY 3291 Research Laboratory

1 QH

Allows students and faculty advisers to discuss lab projects, current literature, theory, and applications.

PSY 3419 Special Topics in Psychology

PSY 3521 MABA Research

0 QH

Students enrolled in the MABA program may sign up for this course beginning in their *third* year to indicate that they are continuing their research.

PSY 3549 Practicum

Offers supervised practicum experience emphasizing the application of principles of psychology to human behavior.

PSY 3798 Master's Thesis Continuation

0 QH

Offers continuation of experimental work for the master's degree requirement.

PSY 3799 Doctoral Dissertation Continuation

0 QH

Offers continuation of experimental and theoretical work for PhD candidates.

PSY 3891 Thesis

2 QH

Offers experimental work for the master's degree requirement.

PSY 3894 Dissertation

0 QH

Offers experimental and theoretical work for PhD candidates.

Interdisciplinary Courses

INT 3225 Foundations of Neural Science

Introduces some of the fundamental problems and principles of neuroscience, emphasizing its multidisciplinary nature. Topics include nerve cell biology, nerve cell chemistry, central nervous system chemistry and disorders, visual perception's neural basis, developmental changes in nervous system tissue, and the neurobiology of motivated behaviors. Introduces the nervous system and how it may be studied, indicating the neuroscience resources available at Northeastern University. Includes lectures by specialists in each of these areas.

INT 3226 Topics in Neural Science

Offers lectures by specialists on central concepts, themes, and commonly used methodologies in neuroscience. Presents practical and theoretical aspects of neuroscience. Draws topics from current Society of Neuroscience Meeting Programs based on guest speakers' availability.

**Graduate School of Boston-Bouvé College
of Human Development Professions**

All courses carry four quarter-hours of credit unless otherwise specified. Please see the current schedule for summer, fall, winter, and spring quarter listings.

Counseling Psychology, Rehabilitation, and Special Education

CRS 3401 Educating Individuals with Learning Disabilities

Surveys behavioral and socio-emotional characteristics of children and youth who manifest specific defects in perceptual, integrative, or expressive processes that impair learning. Analyzes current service delivery programs, individual learning styles, and related curriculum materials for elementary through high school-aged, learning disabled students.

CRS 3404 Education of Individuals with Behavioral Disorders

Studies the various theories, programs, and approaches dealing with emotional disturbance. Emphasizes the role of the educator as it relates to the therapeutic management of individuals and groups displaying problems in socio-emotional development. Discusses parent-teacher interaction.

CRS 3405 Group Dynamics

Emphasizes understanding group growth, behavior, and action fundamental to developing solutions to the complex developing of group life. Teaches students to learn to examine their strengths and weaknesses, to examine group leadership styles, to become alert to new ideas and actions, to discover the pulse of a group, and to analyze reasons for one group's productivity and another's nonproductivity.

CRS 3408 Socio- and Psychodynamics of Family Life

Considers the internal and external dynamics of family life and the significance of such dynamics to the mental health of handicapped individuals and their families. Emphasizes the impact of disability on family functioning and integration. Explores approaches to working with parents of special needs groups from psychodynamic, social learning, and systems viewpoints.

CRS 3412 Psychology of Individuals with Special Needs

Studies the social and emotional adjustment of the handicapped and of the psychological significance of cognitive, sensory, and motor variations. Evaluates relevant legislation, the effects of limitations imposed by attitudes of society, the attitudes of individuals toward their handicaps, and the effect of the handicap itself. Discusses implications for educational programs and life span management. This course should be among the first taken in the Special Education sequence.

CRS 3415 Assessment in Special Education

Offers a field-based course that gives students the opportunity to learn to administer selected norm-referenced tests for special needs populations, determine which tests will yield the most information in a variety of case studies, and interpret data from a minimum of four norm-referenced test batteries.

CRS 3416 Diagnostic Prescriptive Teaching

Offers a field-based course that focuses on the understanding, development and implementation of individualized educational programs, including development of criterion-referenced tests, tasks analysis, annual goals, and short-range objectives; educational strategies and their application in classroom management; adaptation and selection of materials and strategies in various academic areas; perceptual-motor skills; and social-emotional interventions.

CRS 3419 Practicum in Special Education: Fieldwork

Requires students to spend 250 hours in appropriate special education settings. Placements may be for one or two quarters. Requires attendance at seminars.

CRS 3420 Practicum in Special Education: Student Teaching

Requires students to spend a minimum of 300 hours in a placement that is appropriate for the certification sought (moderate or severe). Requires placement "in the role of" and "at the level of" certification sought (moderate, N-9 or 5-12; severe, all levels). Requires attendance at seminars.

CRS 3424 Etiology and Development of Special Needs

Explores factors that primarily affect deviations in cognitive, motoric, emotional, and physical development. Uses understanding of these factors to discuss multidisciplinary life-management issues. Discusses psychobiological, psychodynamic, and learning theory approaches and relates to problems of lifespan management.

CRS 3427 Seminar: Neuropsychology of Learning and Behavior Disorders

Through critical review of the literature, analyzes and discusses varied neuropsychological interpretations of the nature of learning and behavior disorders. Topics include biochemical and physiological correlates, cognitive and perceptual factors, genetic and maturational variables, hemispheric specialization, and implications of drug studies. Considers implications of the above for educating and serving special needs individuals as useful to administrators, teachers, counselors, reading specialists, school psychologists, and those in allied health fields. Expects students to give a presentation in an area related to the seminar topic. *Prereq.* CRS 3401.

CRS 3428 The Severely Handicapped

Reviews causes of handicapping conditions and considers the implications of severe multiple handicaps in home, educational, and community settings. Offers students a chance to develop a case study of a severely handicapped person in conjunction with reviewing relevant literature, visiting community

facilities, and interviewing a family with a severely handicapped member.

CRS 3429 Assessment and Program Development for the Severely Handicapped

Includes observation of severely handicapped persons in the classroom and community; demonstration of evaluation and assessment techniques; and analysis of developmental, educational, and rehabilitation plans for severely handicapped persons.

CRS 3430 Behavior Management

Helps students design and implement behavior management programs for special needs children, youths, and adults. Synthesizes the various theoretical aspects of behavior modification in various field-based projects. Allows students to work with learning disabled, emotionally disturbed, or mentally retarded individuals to pinpoint target behaviors, chart baseline and intervention data, use appropriate reinforcement schedules and reinforcers, and evaluate necessary program changes. Serves as field-based course required for all Moderate and Severe Special Education majors and recommended for students in School Psychology. *Prereq. Appropriate background in learning theory.*

CRS 3433 Introduction to Rehabilitation

Provides an overview of an orientation to the field of rehabilitation, including its historical development, legislative involvement, psychological implications, and sociological dimensions. Emphasizes coordinating and integrating services as they relate to the field of rehabilitation as a community process.

CRS 3434 Principles of Medical Rehabilitation

Explores the wide spectrum of disabilities that could profit from rehabilitation, including orthopedic, neurological, medical, surgical, and mental disabilities. Presents basic principles of medical rehabilitation that administrators should know. Discusses psychological aspects of disability.

CRS 3435 Program Development

Deals with program development for the physically handicapped, mentally retarded, emotionally disturbed, aging, welfare populations, youthful offenders, culturally disadvantaged, and other special community groups. Emphasizes the administrative involvement in developing and supporting the diagnostic, evaluative, counseling, and placement procedures used in such rehabilitative programs. Explores issues involving clinical program planning.

CRS 3436 Organization and Administrative Theory

Examines the body of conceptual knowledge regarding organizational and administrative theory. Examines formal and informal organizations, organizations as social systems, status and role concepts, leadership in organizations, power structure, relationships to authority, decision making, and communication in and between organizations.

CRS 3437 Community Planning

Presents what administrators need to know about community planning to develop programs in their

areas. Examines basic principles of community planning, organization, and dynamics, as well as interdisciplinary relations. Studies examples of community planning from different agencies and the referral process among these agencies.

CRS 3440 Program Evaluation

Emphasizes administrative research, program evaluation, and grantsmanship. Gives students the opportunity to develop a research design on some aspect of administration and carry out the necessary research operations involved.

CRS 3443 Administration of a Sheltered Workshop

Explores special problems of administering a sheltered workshop, such as community planning, work evaluation, job training, labor relations, contracting, production, and occupational placement.

CRS 3445 Legal Aspects of Rehabilitation and Special Education

Sensitizes rehabilitation administrators, special educators, rehabilitation counselors, and other personnel to the impact of legislative developments upon the field of rehabilitation and special education. Emphasizes understanding the legal implications for rehabilitation of the latest Vocational Rehabilitation Administrative Amendments, workers' compensation laws, eligibility determination criteria, and Social Security Amendments. Covers latest federal and state special education legislation.

CRS 3446 Occupational Placement

Studies the dynamics of moving the rehabilitation client into the world of work within the framework of the specific community structure. Considers development of facility in use of resource materials in occupational information, job description and analysis, performance appraisal, training, and vocational assessment. Discusses and analyzes the personnel point of view of the handicapped individual and develops more effective placement practices.

CRS 3448 CAGS Rehabilitation Practicum

Students are usually assigned to rehabilitation agencies where they are expected to spend 250 hours under appropriate supervision. A seminar with faculty members is conducted twice each quarter.

CRS 3449 Psychological Problems of Disability

Offers an advanced course in psychopathology as it relates to the impact of disability on personality. Studies in depth the moderately and severely handicapped from the viewpoint of psychosocial factors, interpersonal relationships, and cognitive versus noncognitive functioning in those with motor and sensory disabilities; problems of dependency and motivation; role of psychosomatic factors. Discusses the role of treatment and rehabilitation.

CRS 3450 Administrative Problems in Rehabilitation

Offers a seminar designed to analyze, in depth, critical issues and selected rehabilitation problems. Highlights operations and systems research as applied to rehabilitation. Uses institute research studies and studies available through social and rehabilitation

services, completed research, and demonstrative projects.

CRS 3451 Essentials of Case Management and Supervision

Considers the relationship between case management and casework supervision. Topics include the dynamics of the communication process, decision making, conflict, resolution and compliance, management of resources external to the organization, structural and functional analysis of supervisory process, and caseload management.

CRS 3452 Rehabilitation of the Alcoholic and Drug Dependent

Studies comprehensive factors, including the nature of etiology dynamics involved in alcohol and drug dependency; techniques for evaluation; and rehabilitation administration, planning, and treatment.

CRS 3455 Critical Issues in Rehabilitation Administration

Explores and discusses the highly problematic issues of today's field. Among these issues are the breadth of the concept of disability, appropriate training sequences for the various rehabilitation disciplines, resolution of conflict over role overlap among disciplines, appropriate models for service delivery systems. The most current and relevant research may be brought to bear upon these areas, as well as knowledge from the reservoir of experience of instructors, visiting experts, and the student participants themselves. Students will be exposed to the issues as they exist in the profession and in the community. A theoretically oriented frame of reference will be brought to bear upon problems when feasible.

CRS 3460 (2 QH), CRS 3461 (3 QH), CRS 3462 (3 QH) Rehabilitation Administration Practicum, 1, 2, 3

Assigns students to a variety of rehabilitation agencies for their practicum experience. Considers problem solving relevant to experiences encountered in internship. May include a seminar regularly conducted by a senior faculty member in conjunction with the practicum experience. Offers students an opportunity to share their fieldwork experiences and resolve problems in rehabilitation which are connected with their field placements.

CRS 3500 Foundations in Professional Psychology and Human Services

Provides a philosophical and theoretical background for beginning graduate students in counseling. Sharpens the "self as instrument" through study and discussion of established theories of helping related to one's personal value system and through self-exploration and increased self-understanding in heretofore unexplored personal areas; introduces students to the broad spectrum of professional helping service areas with the intent of clarifying the students' professional roles; and begins to promote the development of a professional identity as a psychological helping professional.

CRS 3501 Psychological Testing

Discusses the principles and problems of psychological testing as applied to the work of the counselor. Considers technical concepts applicable to the use,

understanding, and interpretation of test scores. Gives students the opportunity to become familiar with the most frequently used tests of intelligence, aptitude, achievement, interest, and personality. Evaluates tests for use in diagnosis and in understanding human behavior, with emphasis on their interpretation.

CRS 3502 Vocational Development and Occupational Information

Deals first, with theories about the ways in which individuals make decisions concerning their choice of vocation and second, with the kind of data needed to assist people with these decisions. Considers these requisite data in the relationship of social and economic change to occupational trends, the classification and description of occupational fields, methods of collecting, evaluating, filing, and disseminating vocational information, and the role of the counselor in fulfilling these functions.

CRS 3503 Counseling Theory and Process

Provides the student with a basic cognitive understanding of several major theoretical approaches to counseling. Helps students to become familiar with a wide range of individual counseling strategies, to develop listening, understanding, and communications skills, and to further probe their own self-understanding as counselors. Discusses and simulates these skills and understandings in the context of a variety of settings with a variety of clients. Uses role playing, case material, and audio and video materials. Open to degree and nondegree students with permission of the instructor during winter and spring quarters.

CRS 3507 Group Counseling

Introduces theories, principles, and techniques of counseling with groups of individuals at different levels of development and for varying purposes. Involves students in a genuine group counseling experience in order to understand the phenomenon of group experience. *Prereq.* CRS 3503 or permission of instructor.

CRS 3508 The College Student and the Campus

Examines the relationship between college students' behavior and their environment, with focus on students' rights, their social-emotional developmental concerns, and their search for identity. Examines the impact of societal forces and nontraditional patterns of learning on college curriculum options and discusses varying concerns of personnel services in different types of college climates, including the community college. Examines current issues in higher education as they relate to services offered to students.

CRS 3517 Consultation Seminar

Offers a review of various consultation models, including behavioral consultation, process consultation, and systems consultation. Examines current research in the field of counseling consultation. Emphasizes the development of a personal consultation style and enhancement of consultation skills.

CRS 3518 Vocational Psychology

Focuses on career counseling issues, didactic instruction in career development theory, leadership of career development groups, and vocational/leisure counseling. Includes such learning activities as case studies, audio/video tapes in career counseling sessions, and class discussion of problems and their solutions. *Prereq.* CRS 3528.

CRS 3519 School Adjustment Casework

Offers students an opportunity to learn how to identify behaviors that interfere with a student's performance in school. Focuses on psycho-social evaluation skills and reviews therapeutic techniques for promoting insight and behavior change. Introduces the skills needed to organize and participate in teacher conferences and to act as a mental health consultant to teachers and parents. Review related areas of cultural and class factors, research in school phobias, abuse and neglect, drugs and alcohol, self-esteem, and special education laws and strategies.

CRS 3525 Family and Parent Counseling

Focuses on a conceptual understanding of family systems theory and its application to and implications for family counseling. Presents structural, communicative, and strategic approaches to marital, parent, and family counseling as the family is studied as an interactional system, as a seedbed of distress and health. Provides opportunity to become familiar with family assessment, counseling skills, and strategies. *Prereq.* CRS 3503.

CRS 3526 Organization of Services in Student Personnel

Explores, through case simulation and role plays, the legal, philosophical, and management theory bases for decision-making in the process of developing and administering student personnel programs in higher education. Emphasizes translating theory into practice via lectures, discussions, and the analysis of case study materials.

CRS 3527 Counseling Strategies for Children and Adolescents

Intended primarily for students who will counsel in school settings or other settings emphasizing work with children and adolescents. Considers a broad range of approaches, including but not limited to behavior modification, Adlerian, and Reality Therapy strategies. Emphasizes the development of strategies designed to help alleviate typical school-related and developmental problems such as nonachievement, decision making, negative self-identity, and disruptive behavior. Considers the counselor's role as a consultant to teachers, parents, and administrators in effecting positive behavior change. *Prereq.* CRS 3503.

CRS 3528 Vocational Counseling Strategies

Examines the individual's role expectations in the world of work from a human development perspective, and a systematic program to foster self-awareness will be set forth. Views vocational counseling as dealing with the entire individual, including his or her values, underlying psychological needs and drives, and the influence of the

environment on his or her level of development and career awareness. Includes counseling with females and nonachievers, the decline of the work ethic, community resource development, job placement, and information giving as a perceptual process. Intended for a variety of client populations from adolescence through adulthood. *Prereq.* CRS 3503.

CRS 3529 Rehabilitation Counseling Strategies

Emphasizes the roles and functions of the rehabilitation counselor, relevant issues in the field, and an overview of the rehabilitation process. Examines special problems and techniques of counseling with the disabled (physical, mental, and behavioral disorders) through case studies and role playing. Covers disability in the context of social deviance and psychosocial approaches to understanding human behavior, including self-concept, social role theories, and rational-behavioral approaches. *Prereq.* CRS 3503. *This prerequisite is waived for Rehabilitation Administration majors.*

CRS 3530 Psychological Counseling Strategies

Focuses on a variety of change strategies appropriate for older adolescents and adults. Intended for the student working with client populations in mental health settings and college counseling centers. *Prereq.* CRS 3503.

CRS 3531 Case Studies in Marriage and Family Counseling

Presents an advanced-level course for students with previous experience or preparation in marriage and family counseling. Emphasizes the preparation of case studies of family and marriage histories and current functioning; the design of service, counseling, and referral programs based upon comprehensive studies of needs and resources; and the practice of counseling strategies through role playing, taped interviews, and progress reports of current counseling activities. *Prereq.* CRS 3525.

CRS 3532 Seminar in School Psychology

Provides an intensive analysis of philosophical, technical, and school administrative issues contributing to the professional identity and consultative function of the psychologist in an educational milieu. Uses simulations, case studies, and research projects to study these issues. *Prereq.* Permission of instructor.

CRS 3533 Psychoeducational Prescriptions

Recommended for all school counseling majors and required of all school psychology majors. Provides training and supervision in synthesizing data on a student's cognitive, affective, and interpersonal needs with educational plans which are based directly on that data; may be implemented in the school setting; and meet the 766, PL94-142 criteria for such plans.

CRS 3534 Individual Intelligence Testing

Offers preparation to administer, score, and interpret the Stanford-Binet Intelligence Test, the Wechsler Adult Intelligence Test, and the Wechsler Intelligence Scale for Children. Considers the theories of intelligence upon which the tests are based and the use of the tests in educational and clinical settings. Requires students to administer, score, and interpret tests,

6 QH

including some from each of the three tests covering in the course. *Prereq.* CRS 3501.

CRS 3536 Advanced Group Counseling

Follows CRS 3507 but emphasizes developing skill in leadership at a variety of ages. Pays greater attention to relevant readings and research on group process and group dynamics. *Prereq.* CRS 3507.

CRS 3537 Seminar in Counseling Supervision and In-Service Education

Considers theory and practice of the supervisory process as it applies to the evaluation of counselor effectiveness and professional development. Requires theory readings, discussions, role playing, and plans for in-service staff development, but the major activity of the course involves the use of audio and videotapes of actual supervisory sessions conducted by class members (access to actual or simulated supervision clients is an assumed requirement). *Prereq.* Master's degree in counseling or permission of instructor.

CRS 3538 History and Systems of Psychology

Offers an advanced-level counseling course required of all counseling psychology students in the master's, CAGS, and doctoral programs. Designed to expose students to the major historical ideas in western culture that underlie modern psychological theories, methods of human behavior change, and concepts of science. Reviews fundamental steering concepts to give students deepened perspective on the state of contemporary counseling psychology by showing how the historical past has shaped current thought, and to suggest possibilities for development in psychology. *Prereq.* CRS 3530.

CRS 3539 Contemporary Theories of Psychotherapy

Required of all CAGS students. Continues the in-depth focus on the conceptual clinical elements of contemporary psychoanalytic, cognitive, social learning, existential and systemic theories of personality and behavior change. Includes selected readings, lectures, and student discussion. Aims to develop an appreciation for issues involved in the evaluation and future directions of contemporary theoretical schools, and to consider which types of therapies may be suitable for certain types of clients at specific periods of their lives, as well as to critically examine the gender, class, and culture adequacy of theory. *Prereq.* CRS 3538.

CRS 3540 Advanced Psychodiagnostics

Offers an advanced course in psychodiagnostic testing, focusing on the Rorschach test. Teaches the administering, scoring and the basics of interpreting this test, using the Exner scoring system. Integrates Rorschach data with data from other sources, such as personal history data and other projective tests. Trains students in providing clear, pertinent feedback and recommendations. Assumes a rudimentary knowledge of the theory and practice of psychodiagnostics. *Prereq.* CRS 3501, CRS 3534, and CRS 3541.

CRS 3541 Psychodiagnostic Measures

Offers an advanced-level course in clinical assessment. Places heavy emphasis on differential diagnosis and personality description using data from a variety of sources—interviewing, case histories, and objective and projective testing. May include the California Psychological Inventory, Minnesota Multiphasic Personality Inventory, Bender-Gestalt and Sentence Completion Tests, and Draw-A-Person Test. Requires students to administer and interpret psychological test data and to report their findings in a psychological report. *Prereq.* CRS 3501 and CRS 3534.

CRS 3551 Legal, Ethical, and Professional Issues in Counseling and Mental Health

Provides a systematic orientation to the moral, legal, ethical, and professional issues found by mental health practitioners in their teaching, research, and practice. *Prereq.* Doctoral standing or permission of instructor.

CRS 3552 Cross-Cultural Counseling

Helps students develop beliefs/attitudes, knowledges, and skills that will contribute to their becoming culturally sensitive in their counseling and assessment practice. *Prereq.* CRS 3503 or permission of instructor.

CRS 3553 Human Neuropsychology I

Explores brain/behavior relationships and acquaints students with the language and frame of reference of neuropsychology. Introduces neuroanatomy, the topography of the cerebrum, brain stem, and cortospinal system. Covers different theories and approaches to understanding brain/behavior relationships and significant clinical disorders such as alcoholism, aging, epilepsy, language deficits and apraxias, and last, memory disorders and learning disabilities. *Prereq.* CRS 3501 and CRS 3534.

CRS 3554 Human Neuropsychology 2

Describes neuropsychological assessment of adults and children, a rationale for undertaking such an evaluation, the sorts of questions or topics that can be addressed, and appropriate tests and techniques. Covers topics such as laterality, effects of psychiatric disorders, and childhood disorders through a critical review of the literature and research. *Prereq.* CRS 3553.

CRS 3555 Child Psychotherapy

Provides students with a basic understanding of child development, psychopathology, and modes of psychotherapy with children. Addresses the importance of working with parents and with school systems and, through class discussions and readings, give students a sense of how to consult with parents and schools. *Prereq.* CRS 3503 or permission of instructor.

CRS 3556 Feminist Therapy

Introduces the psychology of women, sex roles, gender socialization, and feminism at an intermediate level. Emphasizes the analysis of traditional personality theory, psychopathology, and treatment from a

feminist perspective. *Prereq.* CRS 3501, CRS 3503, and CRS 3530, or permission of instructor.

CRS 3557 Counseling Adults and Families over the Life Span

Utilizes a combined didactic and seminar presentation to develop understanding of life span biopsychosocial issues in adulthood and the implications for counseling adults as they pass through the stages of human development and reciprocal impacts of individual, family, and career. Gives special attention to gender, class, racial, and cross-cultural variables affecting individual and family functioning in larger social systems. Studies clinical interventions in the context of contemporary psychological theory and research. *Prereq.* CRS 3503 and CRS 3525.

CRS 3558 Doctoral Seminar in Counseling Psychology

Seeks to prepare doctoral students to critically analyze their discipline and profession at an advanced level. Identifies and analyzes current research findings, professional trends and disciplinary assumptions. *Prereq.* Permission of adviser.

CRS 3559 Community Psychology

Introduces the history and conceptual base of community psychology. Discusses crisis theory, prevention, and ecological systems theory. Presents consultation skills, model community programs, and women's and minority issues. *Prereq.* Open to doctoral and CAGS students in counseling psychology and school psychology, or permission of instructor.

CRS 3560 (2 QH), CRS 3561 (3 QH), CRS 3562 (3 QH) Counseling Psychology Practicum 1, 2, 3

CRS 3563 (2 QH), CRS 3564 (3 QH), CRS 3565 (3 QH) Industrial Practicum 1, 2, 3

CRS 3566 (2 QH), CRS 3567 (3 QH), CRS 3568 (3 QH) School Counseling Practicum 1, 2, 3

CRS 3569 (2 QH), CRS 3570 (3 QH), CRS 3571 (3 QH) Student Personnel Practicum 1, 2, 3

CRS 3572 (2 QH), CRS 3573 (3 QH), CRS 3574 (3 QH) Rehabilitation Counseling Practicum 1, 2, 3

Offers a supervised counseling experience extended over the academic year. In the fall, emphasizes small group seminars dealing with counseling and other related matters. In the winter and spring quarters concentrates on the supervised counseling assignment. Assigns practicum settings according to the student's major area of concentration. Requires students to make themselves available a minimum of two days per week during the academic year (October to June) for placement in a field setting. Stresses materials germane to the student's major and meets a total of twenty-four times during the year. Each practicum must be successfully completed prior to commencing the next. Part-time students must submit an application for practicum (available from the department) by April 1, for approval to enroll in the practicum the following fall quarter. *Prereq.* CRS 3503 (may be taken concurrently with the beginning of practicum).

CRS 3575 (2 QH), CRS 3576 (3 QH), CRS 3577 (3 QH) School Psychology Fieldwork 1, 2, 3

Presents the first phase of a two-year sequence of supervised fieldwork required for school psychologist certification. Places students in an N-12 school system working under the supervision of a certified school psychologist. Continues for two days a week across the academic year from September to June. Allows students to perform psychological evaluations and participate in other appropriate activities. Includes seminars that meet for twenty-four sessions during the year to provide skill training and discuss role functions. Gives students one hour of supervision per week from the field site supervisor. Students must submit an application for a fieldwork placement by April 1 for approval for the course that begins in the following fall quarter. *Prereq.* Approval of adviser.

CRS 3578 (2 QH), CRS 3579 (3 QH), CRS 3580 (3 QH) School Psychology Fieldwork 4, 5, 6

Involves the second phase of a two-year sequence leading to eligibility for application for school psychologist certification. Assigns students to a different N-12 grade placement from the first experience to provide a diversified experience. Offers placement for two days per week from September to June. Includes seminars that meet twenty-four times across the academic year and consist of case presentations, skill and strategy training, and discussions of case management. Provides for students to work under and receive one hour of supervision from their certified school psychologist site supervisor. Students must submit an application for fieldwork by April 1 for approval to enroll in the fieldwork course the following fall quarter. *Prereq.* CRS 3575, CRS 3576, and CRS 3577.

CRS 3581 (2 QH), CRS 3582 (3 QH), CRS 3583 (3 QH) Advanced Fieldwork 1, 2, 3

Required for all CAGS students. Involves fieldwork placement consistent with students' major professional goals and/or the settings in which they intend to work. May extend across the academic year from September to June and require a minimum of two days per week, or the equivalent, in the fieldwork setting. Includes seminars that will meet, subject to change, on alternate weeks with additional individual supervision on campus. Provides supervision in the field setting. Requires all quarters to be completed before credit will be given for the course. *Prereq.* Counseling practicum or equiv. in experience.

CRS 3612 Psychoeducational Assessment and Screening of Preschoolers

Focuses on the psychological and educational assessment of preschoolers as conducted by school psychologists. Discusses history, issues, and current status of preschool assessment. *Prereq.* Open to CAGS students in school psychology who have completed introductory assessment course, or permission of instructor.

CRS 3615 Student-Staff Development for College Student Personnel

Explores a variety of models for understanding student and staff development in student personnel services. Focuses on assessing developmental needs and designing, delivering, and evaluating educational programs which address those needs. Gives special attention to understanding diversity within student and staff populations. Examines significant life experiences that affect individual development patterns including race and ethnicity, gender, age, disability, and sexual orientation. *Prereq.* CRS 3508.

CRS 3620 Fundamentals of Human Resource Counseling

Develops students' understanding of human resource counseling as a rapidly developing area of applied psychological work in a variety of organizational settings. Considers human resource counseling as a potentially significant social movement for facilitating employee well-being and occupational competence. Surveys basic applied psychological practices employed in human resource development programs. Considers future trends in human resource program development as well as the continuing educational needs of professional counselors. *Prereq.* CRS 3501 and CRS 3503.

CRS 3630 Workshop in Career Development

Focuses on planning and implementing career-development programs for adolescents and adults in schools, colleges, and community-based agencies. Introduces theoretical material on life stages, vocational development, and justifications for career education. Emphasizes the practical techniques presented by successful practitioners. Requires students to develop a program plan for "backbone" implementation.

CRS 3631 Workshop School Adjustment Practice

Focuses on participants' own experiences in work with children and families, the school system, and the community. Uses the case study as problem-solving approach to analyze, explain, and remediate a "presenting problem" within a diagnostic-prescriptive framework. This course is designed for school adjustment counselors who are currently employed in a Massachusetts school system or similar youth workers in other schools or agencies.

CRS 3632 Workshop in Peer Counseling in Schools and Colleges

Explores the philosophy and techniques of training students as counselors for other students. Investigates methods of introducing peer counseling programs to schools and colleges. Offers techniques for presenting the concept to administrators. Provides experience in the group model of peer-counselor training. Requires a research paper that directly applies peer counseling to student's area of professional interest.

CRS 3633 Workshop in Reality Therapy

Offers practice in applying reality therapy principles and gives assistance in developing a plan to implement principles in professional work. Designed for

teachers, administrators, and human service professionals in the health care field, including counselors, psychologists, nurses, and therapists.

CRS 3800 Directed Study

Provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. Not available to special students. *Prereq.* Approval of the chair of the department and of the director of the graduate school. Approval forms must be submitted during the quarter prior to registration for the directed study.

CRS 3801 Thesis**8 QH**

Involves a research activity that may be selected by the student in lieu of two courses (8 QH), with the approval and recommendation of the adviser.

CRS 3803 Institute in Counselor Education**8 QH**

(See general institute description on page 66.)

CRS 3804 Institute in Rehabilitation Administration

(See general institute description on page 66.)

CRS 3805 Institute in Special Education

(See general institute description on page 66.)

CRS 3806 Workshop in Counselor Education

(See general workshop description on page 67.)

CRS 3807 Workshop in Rehabilitation Administration**0 QH**

(See general workshop description on page 67.)

CRS 3808 Doctoral Dissertation

Prereq. Admission to candidacy in the Doctor of Education degree program.

CRS 3850, CRS 3851, CRS 3852, CRS 3853, CRS 3854, CRS 3855**2 QH each****Internship in Counseling Psychology 1, 2, 3, 4, 5, 6**

Required of all doctoral students in counseling psychology. Determines field placement by Internship Committee based upon individual professional goals and experience. Requires a minimum of twenty hours per week for eighteen months for a total of 1,500 clock hours in the internship setting. Provides for students to register for CRS 3850 through CRS 3855 for a total of twelve quarter hours. Involves campus meetings held at least eight times a quarter on a group basis for all interns. Provides on-site supervision for at least two hours per week on an individual basis. *Prereq.* CRS 3581 or equiv. in experience approved by the Internship Committee.

CRS 3856, CRS 3857, CRS 3858**4 QH each****Internship in Counseling Psychology 1, 2, 3**

Required of all doctoral students in counseling psychology. Determines field placement by Internship Committee based upon individual professional goals and experience. Requires a minimum of forty hours per week for nine months for a total of 1,500 clock hours in the internship setting. Provides for students to register for CRS 3856 through CRS 3858 in subsequent quarters for a total of twelve quarter hours. Involves campus meetings held at least eight times a quarter on a group basis for all interns. Provides on-site supervision by a

supervisor from the field site for at least two hours per week on an individual basis. *Prereq.* CRS 3581 or

equiv. in experience approved by the Internship Committee.

Education

ED 3300 Psychology of Learning

Compares basic principles of learning, acquisition, retention, and transfer. Considers the applications of these principles in a variety of areas, for example, child rearing, schooling, rehabilitation. *Suggested prereq.* A course in psychology.

ED 3301 Psychology of Thinking

Surveys the processes involved in cognitive organization and functioning. Focuses on reasoning, concept attainment, and problem solving. Reviews strategies for enhancing cognitive functioning. *Suggested prereq.* A course in psychology.

ED 3302 Psychology of Personality

Considers the personality theories of Freud, Jung, Adler, Sullivan, Horney, Cattell, Allport, Rogers, and other approaches, including the psychosomatic of Alexander and the work of Reich. Examines theories in depth for ways that contribute to an understanding of dynamic factors in personality formation. Compares theories and theorists for a greater understanding of strengths and weaknesses. Discusses social, cultural and philosophic questions. Considers implications of some of the ideas and theories for the therapeutic process. *Suggested prereq.* At least one course, and preferably more, in psychology.

ED 3303 Theories of Developmental Psychology

Reviews representative developmental theories. Compares and analyzes key aspects of these theories with a focus on educational implications. *Prereq.* Permission of instructor.

ED 3304 Child Psychology

Surveys principles of child development from the prenatal period through preadolescence. Reviews physical, cognitive, language, social, and personality development in the context of relevant theory. Considers educational implications.

ED 3305 Adolescent Psychology

Examines social, emotional, and intellectual development in the adolescent years. Studies problems in family relationships and in adolescents' social environment as well as their adjustment in school.

ED 3307 Adult Psychology

Explores the three major areas of adulthood (young adulthood, middle age, and old age) in a context of research findings, academic knowledge, and clinical findings.

ED 3308 Seminar in Child Development

Presents a seminar course with emphasis on discussion of critical issues in child development. Allows for students to select topics, review and evaluate research, examine the relevance of the research to educational theory and practice, and present their

findings and conclusions to the seminar. *Prereq.* A course in child psychology or human development.

ED 3309 Seminar in Adolescent Development

Presents a seminar course with emphasis on discussion of major problem areas facing the adolescent in our society. Stresses social and emotional development. Includes a survey of research. *Prereq.* A course in adolescent psychology or human development.

ED 3310 Personality and Social Structure

Considers human behavior from a combined psychodynamic and sociological point of view, with special emphasis on socialization and the relations between the individual and the collectivity. Examines the integration of relevant theories from psychology, sociology, and anthropology. *Suggested prereq.* A course in sociology, cultural anthropology, or social psychology.

ED 3325 History of Education

Explores some of the historical roots of contemporary educational theory and practice with a focus on selected aspects of educational history from antiquity to the present. Utilizes knowledge gained for the development of a personal educational position.

ED 3326 Topics in the Philosophy of Education

Studies the basic assumptions underlying statements of educational content, process, and aims. Selects materials to be subjected to philosophical analysis from educational and philosophic writings according to themes (for example, authority and freedom, "growth" as an educational objective, the nature of educational relationships). Varies from quarter to quarter, depending on the concerns and interests of students and instructor. Includes brief lectures, mostly discussion.

ED 3327 Seminar in Contemporary Issues in American Education

Discusses selected issues in contemporary American education such as school desegregation, compensatory education, learning problems of the disadvantaged, professionalization of teachers, etc. Reviews relevant research and opinions. The topic or topics of the seminar will be announced in the registration materials distributed in advance of that quarter.

ED 3328 Education and Equality

Investigates the reciprocal relationship between American educational institutions and the equality-inequality dimension of American social structure. Discusses both the traditional view, which celebrates the American public school as a triumph of equalitarianism, and the revisionist view, which emphasizes inequalitarian consequences of American educational practice.

ED 3340 Introduction to Educational Statistics

Studies basic descriptive statistics for measurement and research. Topics include use of statistical notation, measures of central tendency and variability, probability and sampling techniques, theoretical distributions, linear regression and correlation, and an introduction to statistical inference. This course, or completion of a statistics proficiency examination, is required for admission to ED 3342.

ED 3341 Intermediate Educational Statistics

Explores statistical inference of normal populations and discrete data; estimation; testing of hypotheses; multiple correlation; analysis of variance and covariance; contingency; the chi-square test and other nonparametric tests. Emphasizes application in educational research. This course must be completed prior to doctoral candidacy. *Prereq. Successful completion of the statistics proficiency examination; satisfactory completion of ED 3340 or permission of instructor.*

ED 3342 Research Design in Education

Introduces scientific methods of research in education and related fields. Stresses critical reading and understanding of research literature, formulating research hypotheses, constructing a research proposal, and carrying out an individual or group project. Must be included among the first six courses taken by each student. *Prereq. Satisfactory completion of the statistics proficiency examination or satisfactory completion of any graduate-level statistics course offered by Boston-Bouvé College (Students wishing to make arrangements to take the proficiency examination should call 617-437-3302).*

ED 3343 Advanced Research Design

Focuses on methodologies for collecting, interpreting, and evaluating data and deals with biases encountered in the data-collection process. Topics include data collection and interpretation, use of sampling, analysis of variance, covariance, multiple regression, multivariate procedures, and advanced topics in scaling, semantic differential methodology, questionnaire design, interview methodology, and evaluative criteria. Requires students enrolling for this course to design and complete a proposal on this design for the conduct of a research project, which may be carried out as part of a research on either the master's or doctoral level. *Prereq. ED 3341, equiv., or permission of instructor.*

ED 3344 Nonquantitative Research Methods in Education

Considers nonquantitative research methods in the human development professions. Topics include problem formulation, location and selection of data, authenticity of sources, and analysis of data by synthesis. Discusses case-study approaches and style of writing for research proposals. *Prereq. ED 3341.*

ED 3345 Nature and Theory of Psychological and Educational Measurement

Examines the logic of measurement and the nature of human capacities, aptitudes, and abilities. Reviews characteristics of tests, ratings, questionnaires, and

similar instruments with emphasis on their reliability, validity, and utility. Covers item analysis procedures and test standardization.

ED 3346, ED 3347 Independent Research Seminars 1, 2 **4 QH each**

Focuses on the design, conduct, analysis, and reporting of data from an individual research project. May be original or secondary, applied, theoretical, or action research and must be substantially larger in scope than that accommodated by directed study. Involves evaluation that will be based on oral and written interim reports in ED 3346 and oral and written final reports in ED 3347. Will serve as an option to the thesis requirement only for students enrolled in the master's degree program in educational research.

ED 3349 Computer Applications of Multivariate Statistics

Explores concepts, applications, and interpretation of data analyses using the VAX computer and BMDP software package. Provides data to students and asks them to perform and interpret data analyses using statistical procedures including: multivariate analysis of variance and covariance, multiple regression, linear and multiple discriminant analysis, factor analysis and rotational techniques, and canonical correlation. *Prereq. ED 3341.*

ED 3400 Analysis of the Instructional Process

Considers the rational basis for effective teaching and the nature of the educational process. Relates learning theory to the various strategies and activities that can be implemented within a learning situation to meet the needs of the learners, including those with special needs. Employs alternative approaches, research results, and theoretical constructs to help extend the prospective teacher's understanding of the educational process and the role of the teacher in it. Requires fifteen hours of fieldwork. Open to students in teacher certification program.

ED 3401 Fundamentals of Curriculum Development

Examines how goals and objectives are selected and how priorities are determined. Considers methods of designing educational programs to meet specified goals and methods of evaluating educational outcomes in terms of the goals of the program and techniques for modifying programs in the light of such performance.

ED 3402 Methods and Materials for Teaching Children 1

Examines teaching methods and learning materials used in teaching children in a number of educational settings. Helps students establish objectives, plan and execute appropriate learning experiences, and effective outcomes. Focuses on writing skills, art, music, movement, and social studies. Requires fifteen hours of fieldwork. Open to students in teacher certification program.

ED 3403 Methods and Materials for Teaching Children 2

Provides a continuation of ED 3402. Focuses on physical and natural science, mathematics, health and nutrition. Requires fifteen hours of fieldwork. Open to students in teacher certification program. *Prereq. ED 3402.*

ED 3404 Methods and Materials for Teaching Adolescents and Adults 1

Considers specific methods and materials appropriate to teaching adolescents and adults. Develops in the students an understanding of the teaching and learning process, encourages attitudes conducive to and identified with good tenets of teaching, and fosters acceptance of the need to grow constantly and to be aware of the continuing development of our knowledge of the learning-teaching process. Requires fifteen hours of fieldwork. Open to students in secondary teacher certification program.

ED 3405 Methods and Materials for Teaching Adolescents and Adults 2

Provides for the specific subject areas to be attended to. Topics include organizing and presenting lessons, developing teaching materials, using audiovisual equipment, developing and implementing evaluation instruments, and selecting appropriate materials within each field of interest. Requires fifteen hours of fieldwork. Open to students in secondary teacher certification program. *Prereq.* ED 3404.

ED 3406 Procedures of Evaluation

Considers evaluation as a process for the improvement of learning and instruction. Topics include how to measure and evaluate affective, psychomotor, and cognitive dimensions of student growth; test construction; selecting and administering standardized tests; various bases of grading; and methods of reporting student progress. Open to students in teacher certification program.

ED 3407 Student Teaching with Related Seminar 8 QH

Offers a University-arranged practicum of observation and teaching in schools offering comprehensive programs within reasonable commuting distance of the University. Participating on a full-time basis requires the student to develop planning and communication abilities within his major field. Includes biweekly seminars at the University to analyze theory-practice relationships and to examine generic problems of teaching. Open only to students in the nondegree teacher certification program. *Prereq.* *Course in child or adolescent psychology; successful completion of all coursework in the nondegree program.*

ED 3409 Seminar in Curriculum: Alternative Designs

Identifies and analyzes problems in curriculum and instruction in light of the forces affecting the curriculum within the student's area of specialization; design and implementation of solutions to such problems; evaluation and field testing, where feasible. *Prereq.* ED 3401 or equiv.

ED 3420 The English-Language Arts Curriculum

Considers the design and function of the English-language arts curriculum; selected current issues as they impinge upon the English language arts curriculum; the design and function of research in the English-language arts curriculum. Open to certified or experienced teachers. *Prereq.* *Permission of instructor.*

ED 3421 Literature in the English-Language Arts Curriculum

Explores the historical-social, psychological, personal, archetypal, textual, biographical, and philosophical-moral aspects of literary study and their relation to the chronological, thematic, and generic demands of the literature program; sources in literature as they relate to the young reader and the implications for the English-language arts curriculum; the interrelatedness of literature and other components of the English-language arts curriculum. Allows students to identify and investigate areas of individual interest. *Prereq.* ED 3420.

ED 3422 Writing in the English-Language Arts Curriculum

Considers the cognitive and effective bases of imaginative and nonimaginative writing; the role of writing in the relationship between self and object; modes of imaginative and nonimaginative writing appropriate to the young writer; the impulse to expression in the young writer and its implications for the English-language arts curriculum; the interrelatedness of writing and other components of the English-language arts curriculum. Allows each student to identify and investigate an area of individual interest. *Prereq.* ED 3420.

ED 3423 Language in the English-Language Arts Curriculum

Examines the multiple dimensions of language study in the English-language arts curriculum; the role of inquiry in the study of language and its implications for the English-language arts curriculum; theories of grammar and their relation to the study of language in the English-language arts curriculum; the interrelatedness of language and the other components of the English-language arts curriculum. Allows each student to identify and investigate an area of individual interest. *Prereq.* ED 3420.

ED 3424 Topics in English-Language Arts Education

Investigates a matter of immediate concern to English-language arts education, but for which no organized study is ordinarily available. Topics include media in the English-language arts program, behavioral objectives in the English-language arts program, the English-language arts program for the disadvantaged. Announces seminar topic prior to registration.

ED 3427 Literature and Materials Seminar

Examines literature for children, adolescents, and adults; the sources of interest in literature as they relate to the reader; the interrelatedness of literature and other components of the language arts program; investigation of materials available. Allows students to develop projects related to their needs and interests.

ED 3450 Foundations of Developmental Reading

Examines reading and writing as the receiving and generating of language; current developmental reading, writing, and related language skills; selected research findings bearing on relevant topics. Includes ten hours of observation or other field experience for students in the Consulting Teacher of Reading Program only.

ED 3453 Diagnosis and Remediation of Reading and Language Disabilities 1

Explores reading and language disabilities; causes and correlates of disability; language differences; aspects of measurement; diagnostic and corrective procedures in reading, writing, and related language skills; selected research findings bearing on relevant topics. *Prereq.* ED 3450.

ED 3454 Diagnosis and Remediation of Reading and Language Disabilities 2

Continues ED 3453. Examines selected models of language processes; cognitive and affective dimensions; problems in language pathology; academic, perceptual-motor, and neurological learning disabilities; and consulting role of the reading specialist. *Prereq.* ED 3453.

ED 3455 Teaching Reading in Junior and Senior High School

Considers developmental or corrective reading programs at the secondary level. Examines development of reading rate, comprehension, interpretation, and study skills in the content areas.

ED 3457 Clinical Practicum in Reading

Provides practicum in clinical experience, tutoring children and adults with severe reading disabilities in the Reading Clinic for a total of seventy hours under close staff supervision. Includes a one-hour seminar for discussion and case presentation following each tutoring session. Requires diagnosis, lesson plans, daily logs, complete case history, and final progress evaluation. *Prereq.* ED 3453 and ED 3454.

ED 3458 Field Practicum in Reading

Offers an eighty-hour field practicum that offers students the opportunity to apply consulting and remediation skills in a school setting. Allows students to consult with teachers on the implementation of developmental and corrective reading and on reading in the content areas and also to provide diagnostic and remediation to pupils having special needs in reading. *Prereq.* ED 3453, ED 3454, and ED 3457.

ED 3463 Urban Education: An Introduction to Teaching in City Schools

Introduces an overview of urban education, especially in the public schools. Studies the demography of city schools as a basis for identifying diverse special education needs of the multicultural population, such as ESL, bilingual education, and ESD. Includes an overview and investigation of current curricular patterns related to this area of education. Includes readings, guest speakers, and first-hand observations of selected schools and programs.

ED 3470 Teaching Adults: Methods and Materials

Helps prepare participants to instruct adults in a variety of academic and nonacademic settings, and emphasizes the skills and knowledge necessary to identify objectives, plan and execute appropriate lesson plans in keeping with students' requirements, develop curricula in a variety of settings, and evaluate students' performance. Includes the presentation of both theory and application through selected case studies that exemplify adult teaching in different

environments. Helps acquire the necessary skills for developing individual models of adult teaching behavior to suit various circumstances.

ED 3484 Selection and Utilization of Instructional Material

Deals with all aspects of instructional media, surveying types, techniques, advantages, limitations, sources, and methods of using materials and equipment in specified areas. Emphasizes the selection of appropriate media (print and nonprint) to suit given learning objectives. Provides laboratory experience in operation of equipment and the production of instructional materials.

ED 3534 School-Community Relations

Includes the study and design of school-community relations programs based on the principles and practices of the intercommunications between the school and its several publics. Reviews selected research findings relative to public relations programs in business, industry, and governmental agencies in addition to those involving educational systems. Stresses the role of the administrator in the development of a comprehensive program of school community relations to the administrative unit.

ED 3800 Directed Study

Provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. Not available to special students. *Prereq.* Approval of the chair of the department and of the director of the graduate school. Approval forms must be submitted during the quarter prior to registration for the directed study.

ED 3801 Thesis**8 QH**

Offers a research activity that may be selected by the student in lieu of two courses (8 QH), with the approval and recommendation of the adviser.

ED 3806, ED 3807, ED 3808 Doctoral Seminar in Leadership, Administration, and Supervision 1, 2, 3**4 QH each**

Uses the dialogues in these courses as an interdisciplinary approach to explore complex behavioral and structural interactions found in formal organizations. Emphasizes integrating theoretical concerns with practical administrative functioning.

This sequence of seminars is viewed primarily as a pooling of the results of extensive individual student research and activities and is aimed at giving the student an overview of all aspects of the institution he or she will be leading. These seminars open only to students who have been accepted to a doctoral program. Required of all students pursuing the EdD degree.

ED 3809 Doctoral Dissertation

Prereq. Admission to candidacy in the Doctor of Education Degree Program.

ED 3820 Workshop in Foundations of Education**0 QH**

(See general workshop description on page 67.)

ED 3821 Workshop in Elementary Education

(See general workshop description on page 67.)

ED 3822 Workshop in Secondary Education

(See general workshop description on page 67.)

ED 3823 Workshop in Administration

(See general workshop description on page 67.)

O QH**ED 3825 Institute in Elementary Education**

(See general institute description on page 66.)

ED 3826 Institute in Secondary Education

(See general institute description on page 66.)

ED 3827 Institute in Educational Administration

(See general institute description on page 66.)

ED 3828 Institute in Foundations of Education

(See general institute description on page 66.)

Health, Sport, and Leisure Studies

HSL 3412 Seminar in Contemporary Issues and Problems in Recreation, Sport, and Fitness

Discusses national and international issues, current trends, and contemporary problems as they affect recreation services.

HSL 3425 Public Relations and Marketing for Recreation, Sport, and Fitness

The central purpose of public relations is to influence public opinion. This course focuses on the practical aspects of public relations for recreation, sport, and fitness enterprises. Emphasis is on linkages among public relations, marketing, and personnel management.

HSL 3506 Nutrition

Studies nutrition principles, behavior, and counseling, as well as clinical applications of nutrition as it relates to health, exercise, sport, and cardiac rehabilitation. *Prereq.* *Exercise physiology, nutrition, or permission of instructor.*

HSL 3617 Physical Fitness Appraisal and Guidance

Considers principles and procedures used to administer lab and field tests of cardiovascular endurance, body composition, joint flexibility and muscular strength, power, and endurance. Explores principles and procedures used to develop conditioning programs to improve these parameters. Focuses on the low-risk individual in nonclinical settings. *Prereq.* *Exercise physiology or permission of instructor.*

HSL 3618 Exercise in Health and Disease

Studies role of exercise in health and disease including acute and chronic effects of exercise upon the cardiovascular, respiratory, metabolic, and muscular systems of individuals with cardiovascular, pulmonary, or metabolic diseases. Explores efficacy of exercise intervention and rehabilitation programs for individuals with heart disease, chronic pulmonary disease, diabetes, obesity, and other hypokinetic diseases. *Prereq.* *Exercise physiology.*

HSL 3619 Electrocardiography

Studies basic and intermediate electrocardiography, including cardiac function, lead systems, rate, rhythm, axis, infarction, ischemia, hypertrophy, effects of cardiovascular drugs, and purposes and principles of exercise testing. *Prereq.* *HSL 3618.*

HSL 3620 Laboratory in Exercise Testing and Prescription

Offers a practicum in clinical graded exercise testing including determination of EKG, blood pressure,

pulmonary, and metabolic response to exercise, and prescription of exercise for at-risk to high-risk persons in cardiopulmonary prevention, intervention, and rehabilitation programs. Requires students to do clinical fieldwork as exercise test technicians in prevention and/or rehabilitation programs and to conduct a project. *Prereq.* *HSL 3618 and HSL 3619.* (*HSL 3619 may be taken concurrently.*)

HSL 3621 Advanced Cardiopulmonary Physiology

Surveys the current knowledge of cardiovascular function relating the physiology of the circulatory system in its normal, diseased, and stressed states. Emphasizes the interaction between the components of the cardiovascular and respiratory systems. Current research topics will be covered. *Prereq.* *HSL 3618.*

HSL 3622 Cardiovascular Pharmacodynamics in Clinical Exercise Physiology

Studies the current medications used in the treatment of congestive heart failure, coronary artery disease, arrhythmias, angina, and hypertension; the effects of these medications during acute and chronic exercise; and cardiac emergency medications. *Prereq.* *HSL 3619 and HSL 3623.*

HSL 3623 Cardiopulmonary Pathophysiology

Offers lecture and laboratory study of anatomy, physiology, and pathophysiology for the cardiac and pulmonary systems as applied to the dysfunction and rehabilitation of the cardiopulmonary patient. *Prereq.* *HSL 3618.*

HSL 3624 Applied Biomechanics for the Exercise Specialist

Applies anatomical and biomechanical principles to exercise technique, exercise-induced injuries, and exercise equipment. Designed specifically for students in the clinical exercise physiology program, and is not open to students in other concentrations. *Prereq.* *Undergraduate course in anatomy.*

HSL 3627 Health Promotion Program Planning

Examines health promotion programs in a variety of settings including program components, assessment, design, implementation, and evaluation. Discusses case studies from health-related programs to assist students in developing wellness and health promotion philosophy and strategies. *Prereq.* *HSL 3618 or permission of instructor.*

HSL 3642 Sociology of Sport

Analyzes the sociological principles and factors operative in the interaction between sport and society.

Reviews pertinent literature and research. Topics include the pervasiveness of sport, social stratification, politics, economics, sport and the mass media, race, women, violence, competition, deviance, subcultures, and sport in the future. *Prereq. General sociology or permission of instructor.*

HSL 3651 Supervision of Professional Personnel

Studies ways of effectively matching the needs of individuals with those of the organization. Emphasizes leadership, conflict resolution, and evaluation from an organizational development perspective.

HSL 3653 Legal Issues in Recreation, Sport, and Fitness **3 QH**

Analyzes recreation and sport from legal, social, and economic standpoints. Emphasizes the impact of law and legal principles on recreation and sport.

HSL 3654 Club and Sport Enterprise **3 QH**

Provides an overview of the club and resort industries with emphasis on internal and external sources of industry information and practical uses of such information. Studies external factors that influence industry trends. This is an introductory course.

HSL 3656 Strategic Planning for Clubs and Resorts **3 QH**

Analyzes internal and external factors that impact on long-term operations of clubs and resorts. Studies the development and implementation of competitive strategy. Integrates information from the following prerequisites: the club and resort enterprise, club facilities and operations, research design, financial analysis, marketing, and organizational behavior.

HSL 3657 Managing the Professional Sports Franchise **3 QH**

Discusses and analyzes major issues facing managers of a professional sports franchise. Focuses on topics such as corporate structure, finance, player negotiations, contracts, press relations, and auxiliary enterprises.

HSL 3824 Master's Project/Internship **6 QH**

Will be designed in close consultation with faculty and industry sponsor. Intends to develop greater breadth or depth of understanding of important management issues in a specific segment of the recreation, sport, and fitness industry. Provides for projects to be submitted to a faculty committee for evaluation. Concludes as students present orally the findings

related to their projects and defend conclusions against questions raised by the faculty review committee.

HSL 3830 Internship in Clinical Exercise Physiology 1

Offers a supervised part-time internship in a preventive/rehabilitative health and exercise program providing care to individuals with cardiovascular, pulmonary, or metabolic disease, or in an applied exercise physiology laboratory. Includes clinical exercise testing, exercise prescription, and/or exercise leadership. Requires students to complete a minimum of 120 hours during a six- to twelve-week period. Requires a proposal for a review of literature and three case studies related to the internship site to be approved by the student's faculty supervisor.

HSL 3831 Internship in Clinical Exercise Physiology 2

Continues the supervised internship in another role in a preventive/rehabilitative health and exercise program or in an applied exercise physiology laboratory. Requires students to complete a minimum 120 hours during a six- to twelve-week period of clinical experience. Requires a review of literature and three case studies to be completed and approved by the faculty supervisor.

HSL 3894 Independent Study

Under the guidance and direction of a program adviser, gives students the opportunity to develop and conduct projects related to their professional interests. *Prereq. Written proposal and permission of program adviser.*

HSL 3897 Clinical Exercise Physiology Workshop

Offers clinical exercise physiologists and other allied health professionals an opportunity to advance their knowledge and competence in graded exercise testing, exercise prescription, and exercise programming as applied in preventive health and exercise programs designed for individuals with cardiovascular, pulmonary, or metabolic diseases.

HSL 3898, HSL 3899 Seminar/Workshop

Offers special seminars or workshops on topics of timely interest. May provide for graduate credit to be granted for successful completion of a workshop, but credit may not be applied toward a degree program without the program adviser's approval. Allows a maximum of eight quarter hours earned in seminars or workshops to be applied toward the degree.

Speech-Language Pathology and Audiology

SLA 3300 Introduction to Speech and Hearing

Offers an overview of speech and hearing disorders and treatment, and a review of normal speech and hearing development. Requires clinical observations of persons with speech, language, and hearing disorders.

SLA 3301 Hearing Science

Presents concepts related to the physics of sound, followed by an in-depth study of the anatomy and physiology of the normal hearing mechanism. Also discusses principles of psychophysics of audition.

SLA 3302 Anatomy and Physiology of Vocal Mechanisms

Offers an in-depth study of the static structure, musculature, and physiology of the speech mechanism. Emphasizes current research in speech physiology.

SLA 3303 Introduction to Audiology

Focuses on the techniques of audiometric testing and hearing conservation, including a review of hearing sciences and a prepracticum and lab experience in hearing testing.

SLA 3304 Speech Science

Examines the basic sciences involved in speech and audition, including in-depth study of the analysis of sound and the acoustic composition of speech.

Emphasizes a review of current theory and research in speech reception, perception, and production.

Prereq. SLA 3300 and SLA 3301.

SLA 3305 Fluency Disorders

Offers a comprehensive study of the various theories and symptomatologies of stuttering from the earliest historical references through the nineteenth and twentieth centuries. Requires clinical observations.

SLA 3306 Developmental Semantics and Syntax

Analyzes the emerging semantic and syntactical aspects of language in normal and atypical children. Discusses current theory and research in language acquisition. Requires clinical observations of children with normal and atypical language patterns.

SLA 3307 Phonetics and Developmental Phonology

Offers basic training in auditory recognition and symbolization of phonemes and allophones in major North American dialects. Stresses static and dynamic articulatory descriptions. Also includes a review of the developmental sequence of phonemic acquisition.

SLA 3308 Phonemic Disorders

Provides a practical and theoretical examination of phonemic disorders and etiology; also examines diagnostic tools for evaluation and methods of treatment. Requires clinical observations of persons with phonemic disorders.

SLA 3600 Neurological Bases of Communication

Provides the student the opportunity to acquire a basic understanding of neuroanatomy and neurophysiology as they relate to normal aspects of speech, hearing, and language.

SLA 3601 Advanced Study in Articulation Disorders

Explores advanced theories of normal and abnormal phonological development with emphasis on distinctive theory and on phonetic theories of speech production; direct application of theories to diagnosis and treatment of various phonological disorders.

Prereq. Undergraduate course in articulation disorders and permission of instructor.

SLA 3604 Language Disturbances in Children

Emphasizes current theories in language behavior and their practical application to the assessment and remediation of language disturbances in children.

Uses lectures, discussions, and case presentations to focus on the following issues: what constitutes a

language problem, what assessment tools and therapeutic techniques are currently available, and what underlying principles are involved in selecting and organizing the content of a remediation program. *Prereq.* Permission of instructor.

SLA 3605 Aphasia Rehabilitation

Provides training in the diagnosis and remediation of adult neurologically based communication disorders. Reviews clinical methods of diagnosis and demonstrates their application to therapeutic decision-making. *Prereq.* SLA 3600 and permission of instructor.

SLA 3606 Clinical Management in Stuttering

Emphasizes diagnostic techniques, a review of the current therapeutic approaches, consideration of the individual's need in therapy, and the process of behavioral and attitudinal change from within a psychodynamic framework. Considers termination, referral, and group therapy. *Prereq.* Permission of instructor.

SLA 3607 Seminar in Speech Science

Focuses on current physiological, acoustical, and perceptual data used to describe both normal and disordered speaking populations. Examines research techniques and instrumentation in the field of speech science. Discusses the application of theoretical information from speech science to the diagnosis and treatment of communicative disorders. *Prereq.* SLA 3875 and SLA 3876.

SLA 3608 Seminar in Voice Disorders

Considers etiology, symptomatology, and disorder complexes related to phonation. Emphasizes the philosophy and methods used in the assessment and treatment of voice disorders. *Prereq.* SLA 3302 and SLA 3655.

SLA 3610 Audiology for Speech-Language Pathologists

Provides speech-language pathology majors a review of standard procedures and an update of contemporary issues in audiology. Focuses on pathological disruption of the auditory system and on assessment procedures currently applied and their relationship to patient management and treatment plans.

SLA 3620 Diagnostic Audiometry

Presents an in-depth examination of the various uses of pure tone, speech, and impedance measures as they relate to the standard audiological assessment. Covers case history and case reporting. *Prereq.* Introduction to audiology or permission of instructor.

SLA 3623 Differential Diagnosis in Audiometry

Examines in detail the site of lesion test battery approach to differential diagnosis in audiology. Topics include Bekesy, ENG, SISI, tone decay tests, ABLB, acoustic reflex, and auditory evoked potentials (ABR). *Prereq.* SLA 3620 or permission of instructor.

SLA 3624 Amplification

Explores physical characteristics of hearing aids and their performance. Offers theoretical approach to selection and fitting of hearing aids, and analysis of hearing aid dispensing systems. *Prereq.* Introduction to audiology and permission of instructor.

SLA 3625 Psychosocial Aspects of Communication Disorders

Covers the psychological, educational, and social aspects of communication disorders, particularly auditory impairment. *Prereq.* *Permission of instructor.*

SLA 3626 Seminar in Audiology

Offers advanced study of the development of principles and theories associated with modern procedures and methods used in audiology. *Prereq.* *Permission of instructor.*

SLA 3628 Psychoacoustics

Explores the relationship between acoustic stimuli and psychological responses to sounds. Stresses the similarities and differences in the perception of normal hearing and among different types of impaired hearing. Topics include a general review of the physics of sound, detection, discrimination, masking, binaural hearing, and speech perception. *Prereq.* *Permission of instructor.*

SLA 3629 Aural Rehabilitation

Examines various approaches to speechreading and auditory training in detail as they apply to children and adults. Provides an integrated approach to management of hearing-impaired individuals. *Prereq.* *Introduction to audiology.*

SLA 3630 Auditory Pathology

Provides an overview of temporal bone and eighth nerve anatomy. Discusses physiology of the auditory system. Covers the more frequently encountered pathologies affecting the auditory system as well as medical/surgical treatment of those disorders.

SLA 3631 Rehabilitative Audiology

Required of all audiology majors. Provides information about the effects of hearing loss on communication, the role of the audiologist in the rehabilitation process, approaches to counseling, uses of amplification, and issues in industrial and educational hearing conservation.

SLA 3632 Professional Practice

Provides contemporary information relative to the practice of audiology. Topics include planning a business practice, establishing a successful business operation, securing third-party reimbursement, and providing services within state licensing and ASHA ethical guidelines.

SLA 3640 Cerebral Palsy

Studies neuromuscular involvements and concomitant language and speech disorders; intellectual deficits, psychological aspects, communicative disorders of a cerebral palsied population; and testing, placement, and management of the cerebral palsied child with emphasis on a multidisciplinary approach. *Prereq.* *Permission of instructor.*

SLA 3641 Physiological Acoustics

Emphasizes the biophysics of the hearing mechanism, especially in terms of actual clinical utility. Stresses comparative anatomy and physiological analysis. *Prereq.* *Introductory courses in speech and hearing, and permission of instructor.*

SLA 3642 Seminar in Orofacial Anomalies

Considers etiology, symptomatology, and problems associated with orofacial anomalies. Emphasizes the speech, language, and hearing characteristics and the assessment and treatment of persons with orofacial anomalies. Presents psychological and social considerations and analysis of the team habilitative effort.

SLA 3643 Seminar in Speech Pathology

Offers individual research and/or critical review of the literature in some area of basic science, speech sound learning, language, voice, fluency, or multiple disorders, with special emphasis on the impact of deafness on psychosocial development. May include class presentation of material and class discussion. *Prereq.* *Open to graduate students who have completed the equivalent of two quarters of graduate work in speech pathology and have the instructor's permission.*

SLA 3645 Neuropathology

Applies functional neuroanatomy in comprehending the various disease processes involving the nervous system: cerebrovascular disease tumors or malformations, Parkinson's disease, multiple sclerosis, and others. *Prereq.* *Permission of instructor.*

SLA 3647 Seminar in Hearing Science

Offers individual research and/or critical review of the literature in the area of bone conduction of auditory signals, evoked response and audiometry, impedance and audiometry, cortical processing of auditory input, and other related topics. Requires students to be responsible for class presentations of researched material. *Prereq.* *Permission of instructor.*

SLA 3652 Clinical Process in Speech and Language Training

Reviews principles and procedures of the functional analysis of behavior and focuses upon the application of behavioral theory and research to speech, language, and hearing training. Emphasizes clinical investigation in the experimental analysis of behavior of communications disorders and experiences in the application of experimental procedures in assessment and treatment programs. *Prereq.* *Permission of instructor.*

SLA 3653 Seminar in Communication Disorders

Provides an exploration into the development of communication and communication disorders, with focus on early conversational interaction, children's discourse, and pragmatic intents. Emphasizes deficient social bases and their effect on language performance as well as trends for clinical procedures and intervention strategies for language-disordered children. Views communication as the ultimate goal of therapy. Requires course participants to complete a research project on the development of communication and child discourse and its application to clinical assessment and intervention.

SLA 3654 Augmentative Communication

Provides a theoretical understanding of the principles involved in the prescription of hardware and software to the non-speaking, hands-on training in the use of computer software, and on-site clinical training in the

use of that software. *Prereq.* Graduate student status and understanding of principles of learning theory or therapy process or permission of instructor.

SLA 3655 Differential Assessment

Explores and explains the relationship between different models of speech and language processing and their implications for diagnostic procedures and test selection. Focuses on analysis of case history information, interpretation of diagnostic results, understanding normative data, evaluation of test reliability and validity, and demonstration of various test instruments.

SLA 3690 Seminar in Normal Language Acquisition

Assesses current theories and designs of studies of language acquisition and processing from infancy through adolescence. Discusses special problems in data collection and analysis in the various areas of child language through lectures, student presentations, and discussions of current research. Critiques methodology, data, and results of current research and their significance to theories of language acquisition using video-taped and audio-taped data samples. Requires each student to write a research proposal to investigate a specific topic in language acquisition.

SLA 3691 Sociolinguistics

Consists of basic sociolinguistic concepts including dialectal variation and other forms of language variation, attitudes toward language use and the speech community; language needs of multicultural children in educational settings, considering cultural attitudes of teachers and types of learning situations available; and social and cultural diversity and its effects on the individual's communicative competence. Includes methods of sociolinguistic research that will lead to the student designing a language study for application in: discourse analysis; language in the classroom; sociolinguistic effects on reading, writing, oral language, and role relationships.

SLA 3698 Workshop in Speech Pathology and Audiology 0 QH

(See general workshop description on page 67.)

SLA 3699 Institute in Speech Pathology and Audiology

(See general institute description on page 66.)

SLA 3800 Directed Study

Provides for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. Not available to special students. *Prereq.* Approval of the chairperson of the department and of the director of the graduate school. Approval forms must be submitted during the quarter prior to registration of the directed study.

SLA 3801 Thesis 8 QH

Offers a research activity that may be selected by the student in lieu of two courses (8 QH), with the approval and recommendation of the adviser.

SLA 3875 Advanced Clinical Practice 1 2 QH

Offers a two-quarter sequence of supervised clinical experience in speech pathology and audiology designed for beginning graduate students. Includes practicum sites at the Northeastern University Hearing, Language, and Speech Clinic; satellite clinics; and/or educational settings. Requires students to be available a minimum of two days per week during the academic year. Requires attendance at on-campus seminar meetings held weekly. *Prereq.* Departmental permission and GPA of 3.0.

SLA 3876 Advanced Clinical Practice 2 3 QH

Offers a two-quarter sequence of supervised clinical practicum in speech pathology and audiology at the Northeastern University Hearing. Considers language and speech clinic; medical settings; educational settings; and rehabilitation centers. Uses practicum experience to emphasize advanced diagnostic and management techniques stressing the application of theory to practice. Requires students to be available a minimum of two days per week during the academic year. *Prereq.* Departmental permission and QPA of 3.0.

SLA 3877 Advanced Clinical Practice 3 3 QH

Offers a two-quarter sequence of supervised clinical practicum in speech pathology and audiology designed for advanced graduate students. Uses practicum experience to emphasize problem-solving techniques relevant to case management. Requires students to be available a minimum of two days per week during the academic year. *Prereq.* Departmental permission and QPA of 3.0.

Interdepartmental Courses

INT 3500 Research Design and Methodology

Considers research methods and designs used in a variety of professional settings. Emphasizes the development of research techniques, including the ability to define research problems; write hypotheses; review and interpret literature; apply research designs; organize, analyze, and present data; and draw relevant conclusions. *Prereq.* Satisfactory completion of the proficiency examination in statistics or satisfactory completion of any graduate-level statistics

course offered by Boston-Bouvé College of Human Development Professions.

INT 3501 Thesis/Project 1

Provides the initiation of a scholarly investigation. Requires students to submit a written research proposal for approval by a thesis/project committee and to present an oral proposal at a college seminar. *Prereq.* ED 3340, INT 3500, completion of two courses in area of concentration, and permission of program adviser.

INT 3502 Thesis/Project 2

Continues INT 3501 implemented with, and culminating in, an approved written report in thesis form. *Prereq.* INT 3501.

INT 3503, INT 3504 Seminar/Workshop 3 QH each

Offers special seminars or workshops on interdepartmental topics of timely interest. Graduate credit may be granted for successful completion of a workshop, but credit may not be applied toward a degree program without the program adviser's approval. A maximum of eight quarter hours earned in seminars or workshops may be applied toward the degree.

INT 3540 Computer Applications for Nonprofit Organizations 3 QH

Presents ways in which generic software packages (database management, spreadsheets, business graphics, and word processing) may be used to improve efficiency and the effectiveness of individuals and organizations. Discusses hardware and software configurations.

INT 3552 Computer Use for Educators 2 QH

Designed for educators with minimal computer experience and provides an introduction to word processing, data processing, and file management. Discusses functions of the operating system and the physical hardware. Introduces the BASIC programming language. Gives students extensive hands-on experience in class and through accompanying supervised labs.

INT 3553 Word Processing for Educators 2 QH

Teaches a variety of word processing software programs. Considers applications of word processing

ranging from simple one-page letters to documents and mail-merge. Gives students extensive hands-on experience with computers in class and through accompanying supervised laboratories.

INT 3554 Computers in Education

Focuses on the use of computers both as a teaching methodology and as an administrative tool in education. Introduces the use of Computer Assisted Instruction (CAI) through the BASIC programming language. Tests a variety of microcomputer software packages suitable for classroom and administrative use in a laboratory setting. Requires extensive hands-on experience with a number of commercially available educational software packages. Highlights strategies and methods for integrating computing within the elementary and secondary curriculum.

INT 3555 Introduction to Computer Use for Professionals

Includes introduction to computer capabilities and limitations; selection of hardware/software; use of a line editor, introduction to system command language; and introduction to data processing through a packaged library program such as SPSS, BDMP, MINITAB, or IMSL.

INT 3556 Educational Applications of Database Management Systems

Uses several general purpose software packages (database, spreadsheet, and data analysis) and simulations for working through such problems as scheduling/facilities usage, recordkeeping and general ledger/accounting, and survey/market research.

Institutes

CRS 3803 (8 QH), CRS 3804 (4 QH), CRS 3805 (4 QH), ED 3825 (4 QH), ED 3826 (4 QH), ED 3827 (4 QH), HSL 3822 (3 QH), HSL 3898 (4 QH)

A department may offer a special institute in a specific field of interest from time to time. The institute may be collaborative, offered by the several departments in the Boston-Bouvé College of Human Development Professions, and will usually include a special institute faculty drawn from resources outside the University, and from the Boston-Bouvé faculty. The institute focuses on a specific area of academic study and may be interdisciplinary in nature; it involves total time commitments on the part of participants in morning, afternoon, and evening sessions, five or six days per week, for one to eight

weeks, depending upon the nature and scope of the institute. Institutes are customarily designed for participants who are currently employed in a common field of work and wish to receive additional preparation in new methods, new materials, and new content areas. Graduate credit may be granted for successful completion of an institute but may not be applied toward a degree program at the University without the approval of the departments in which students are doing their major field of specialization degree work. All institute participants must be degree candidates in the graduate school or must qualify, prior to registration, as special graduate students. *Prereq.* *Permission of institute instructor.*

Workshops

CRS 3806 (4 QH), CRS 3807 (0 QH), ED 3820 (0 QH), ED 3821 (4 QH), ED 3822 (4 QH), ED 3823 (6 QH), HSL 3823 (4 QH), HSL 3899 (4 QH), SLA 3698 (0 QH)

A department may offer a special workshop in a specific field of interest from time to time. Emphasis in the workshop is focused on the development of instructional materials or the resolution of practical problems with a single school or institutional setting. Workshops may also be held for a group of potential participants who are currently employed in a

common field of work. Graduate credit may be granted for successful completion of a workshop but may not be applied toward a degree program at the University without the approval of the departments in which students are doing their major field of specialization degree work. All workshop participants must be degree candidates in the graduate school or must qualify, prior to registration, as special graduate students. *Prereq. Permission of workshop instructor.*

Graduate School of Business Administration

All courses carry three quarter-hours of credit unless otherwise specified. Please see the current schedule for summer, fall, winter, and spring quarter listings.

ACC 3301 Financial and Managerial Accounting

Examines and evaluates financial and managerial processes to develop the participant's ability to request, use, and supply financial information. Includes financial statement analysis, funds flow, cost behavior, budgeting, capital investment analysis, and management control systems. For nonbusiness majors.

ACC 3811 Financial Accounting

Introduces the accounting system and the techniques of recording, summarizing, and reporting the flow of financial information through the entity concerned. Presents an examination of the information flow process plus the necessary techniques for analysis and evaluation of the firm's potential in the light of historical data.

ACC 3812 Management Accounting

Examines appropriate use of accounting and nonfinancial data for decision-making in and controlling of a business. Analyzes cost behavior as it relates to volume and profit for operation decisions and use of cost data in capital investment decisions. Studies techniques to develop and use comprehensive budgets for planning, motivating, coordinating activities and monitoring performance of a business and its functional components. *Prereq. ACC 3811.*

ACC 3813 Management Control Systems

Studies management control system as a key technique to assist a firm in achieving its goals and objectives. Topics include the process of translating long- and short-term goals into operating budgets, measuring performance for reward systems and assisting in decision-making, and specific techniques for evaluating performance. Emphasizes decentralized organizations with multiple operating divisions. Addresses developing, evaluating, and improving existing management control systems to respond to the firm's environment and goals through readings and case analysis. *Prereq. ACC 3812.*

ACC 3903 Management Control in Nonprofit Organization

Uses lectures and case studies to help students develop an understanding of the role of the manager in the nonprofit control process, the design and implementation of a new control system, and the management of a system which will adapt to changing environments and organizational needs. Topics include the characteristics of bureaucratic behavior and problems associated with implementing a control system where it may not be desired and understood; and methods of defining and relating the inputs and outputs of nonprofit organizations, including the use of cost accounting, capital and program budgeting, personnel systems, and benefit/cost analysis. *Prereq. ACC 3813.*

ACC 3918 Corporate Financial Reporting and Analysis 1

Investigates contemporary financial reporting problems. Discusses conceptual and pragmatic issues of income determination and financial disclosure.

Emphasizes interpretation and analysis of alternative accounting treatments. Topics include inventory methods, plant assets, and long-term debt. *Prereq. ACC 3812.*

ACC 3919 Corporate Financial Reporting and Analysis 2

Continues examination of the financial reporting environment. Analyzes the economic consequences of complex transactions and related disclosures. Surveys current reporting requirements and analysis of recent developments in financial reporting. Topics include stockholders' equity, earnings per share, pensions, and leases. *Prereq. ACC 3918.*

ACC 3922 Auditing

Introduces the function of the public accountant. Covers matters of professional conduct and ethics, legal liability, generally accepted auditing standards, internal control, statistical sampling, audit reports, and the impact of electronic data processing on auditing. Although a conceptual approach is employed, covers auditing procedures as they relate to specific areas. *Prereq. ACC 3812.*

ACC 3962 Tax Factors in Business Decisions 1

Surveys the Internal Revenue Code and its implications for choice of organizational form, corporate reorganizations, and compensation policies. Examines mergers and acquisitions and the management of depreciable property in the light of decisions made by the Internal Revenue Service and the tax courts. Emphasizes tax planning and research into corporate income tax problems that affect business decisions. *Prereq. 15 QH of graduate credit and ACC 3812.*

ACC 3963 Tax Factors in Business Decisions 2

Aims to establish an in-depth understanding of selected tax planning topics: deferred compensation plans, mergers and acquisitions, small business organization, and business planning interactions with estate planning. *Prereq. ACC 3962 or permission of instructor.*

ENT 3922 Small Business Consulting

Helps students who have completed courses in the major functional areas achieve insights into the consulting sector of our business society. Emphasizes tools used in problem identification and in seeking realistic solutions for the small business manager. Requires each student to be assigned to a team that will be applying these skills with a small business in an attempt to find solutions to a real, current problem. Requires a final written report and oral presentation of this consulting assignment. *Prereq. 15 QH of graduate credit.*

ENT 3929 New Venture Creation

Gives students the opportunity to build a complete business plan for a new, high-potential venture. Covers all aspects of planning, from the point of view both of the prospective entrepreneur and the potential investor. Emphasizes the demand of an entrepreneurial career through readings, self-assessment exercises,

and group projects. Presents guest speakers from start-up companies and legal and venture capital firms to provide up-to-date business experiences. Recommended for prospective entrepreneurs and others whose career activities may involve new ventures. *Prereq.* 15 QH of graduate credit.

ENT 3965 Management of Small Business Enterprises

Presents the operating problems of managing small enterprises. Explores case studies that develop analytical approaches for appraising the risks and rewards of potential growth opportunities, as well as operating problems. Presents problems that range from locating, evaluating, marketing, and financing a small company to the survival and growth of an established business. Presents guest speakers who relate pertinent business experiences to in-class activities. *Prereq.* 15 QH of graduate credit.

ENT 3968 Management of New Enterprises

Designed for students who are interested in either starting or working for small businesses. Explores how clever, effective marketing is essential for the growth of small companies. Explores the creation of a company image and establishing business strategy through market research and competitive analysis techniques suitable for the small business. In the context of a term project, teaches the various dimensions of implementing effective marketing programs for a small business, the market research for which includes surveying prospective customers and investigating competitors and suppliers. Results in a marketing plan for a new venture. Includes class readings, case analyses, and guest speakers from industry. *Prereq.* 15 QH of graduate credit.

FIN 3301 Financial Analysis

Traces the flow of funds within an organization, working capital management, capital markets, capital budgeting, and financial analysis. Builds on topics covered in ACC 3301. For nonbusiness majors.

FIN 3760 International Financial Management

Deals with the specific concepts, policies, and techniques for the financial management of the multinational firm. Topics include operations of the foreign exchange markets, managing foreign exchange risk, sources and instruments of international financing, foreign direct investment and the management of political risk, multinational capital budgeting, and financing control systems for the multinational firm. *Prereq.* FIN 3812.

FIN 3770 Small Business Finance

Utilizes the basic processes, principles, tools, and concepts of finances within the parameters of a small business to develop a complete financial plan. Constructs a comprehensive plan that projects the future circular flow of funds by analyzing and then integrating the impact of both investment decisions (use of funds) and financial decisions (source of funds). *Prereq.* FIN 3812.

FIN 3811 Financial Management 1

Presents concepts, practices, and procedures of financial management, and offers training in analytical

approaches helpful in making wise decisions affecting the flow of funds available to an organization. Topics include financial analysis and forecasting, domestic and international working capital management, and an introduction to security types and markets. Instruction is primarily through readings and cases. *Prereq.* ACC 3812 and MSC 3802.

FIN 3812 Financial Management 2

Concentrates on long-term sources and uses of funds, including capital budgeting techniques, dividend policies, and the concept of cost of capital. Studies risk and return trade-offs. Studies broad topics of overall financial strategy and timing both domestically and internationally. *Prereq.* FIN 3811.

FIN 3901 Financial Strategy

Covers the opportunity to study several important areas of financial management in greater depth than is possible in the basic finance courses. Emphasizes strategies that financial managers can pursue to maximize the value of their firms. Instruction is primarily through reading and classroom case discussions. *Prereq.* FIN 3812.

FIN 3916 Capital Investment Decision Analysis

Analyzes capital budgeting techniques and portfolio considerations combined with an assessment of factors affecting a firm's capital structure. Considers company assets and how they should be financed. Explores the most recent developments in financial management. *Prereq.* FIN 3812.

FIN 3918 Working Capital Management

Examines strategies of and analytical approaches to managing current assets and current liabilities. Explores corporate cash management under changing money market conditions and discusses the use of interest rate futures and working capital management in a multinational context. *Prereq.* FIN 3812.

FIN 3920 Real Estate Investment and Analysis

Helps provide students with a comprehensive understanding of real estate finance. Emphasizes factors affecting real estate investment. Topics include valuation (appraisal), market analysis, development, taxation, ownership types, short-term financing, mortgage markets, and investment strategies. Designed for students interested in a general overview of real estate finance, as well as those intending to pursue a career in the real estate field. *Prereq.* FIN 3812 and MSC 3803.

FIN 3921 Investment Analysis

Focuses on the development of a sound investment program, with attention to identification of investment principles, objectives, and risks. Emphasizes the techniques of analysis, evaluation of various types of securities and the associated risks, the operation of the securities markets, and methods of portfolio management. *Prereq.* FIN 3812.

FIN 3923 Business Turnarounds

Concentrates on the diagnosis, prescription, and implementation of actions pertinent to business turnarounds, troubled companies, workouts,

bankruptcies, and liquidations. Guides the student through the maze of financial, ethical, legal, general business, and strategic aspects of turnarounds by considering case studies and readings. Culminates in the student evaluating and developing a turnaround plan. *Prereq.* FIN 3811.

FIN 3924 Mergers and Acquisitions

Studies the environments that have recently given rise to a large number of corporate mergers and the business factors underlying these corporate combinations. Examines the financial, managerial, accounting, and legal factors affecting mergers. Teaches how to appraise a potential merger and structure a merger on advantageous terms. *Prereq.* FIN 3812.

FIN 3925 Investment Banking

Presents issues associated with policy, strategy, and administration of investment banking firms. Topics include issuance of securities, the service function of investment bankers, pricing a negotiated issue of common stock or competitive bid issue, and meeting capital requirements of a securities firm. *Prereq.* FIN 3812.

FIN 3926 Bank Management

Uses case studies and analyses to examine the management policies of commercial banks. Focuses on the lending, investment, and liquidity management policies of these financial institutions and the current issues and problems faced. *Prereq.* FIN 3812.

FIN 3927 Portfolio Management

Deals with portfolio construction, revision, and performance measurement. Highlights portfolio construction in an efficient capital market. Explores risk-return analysis, the effects of diversification on risk reduction, and the costs of inflation, taxes, and transaction costs of fixed income and equity security portfolios. Examines financial models of capital asset pricing as the basis for the analysis of portfolios from the institutional investor's viewpoint. *Prereq.* FIN 3921.

FIN 3928 Risk Management and Insurance

Introduces the concepts of risk and risk bearing in the business firm. Examines risk identification and analysis, measurement of loss possibilities, and the principal methods of managing such contingencies. Includes some nontraditional areas, such as speculative risk and foreign operations. Discusses insurance in detail as a major method of managing certain types of risks. Stresses aspects that directly relate to the financial management function, such as insurance markets and products, selecting insurers and insurer intermediaries, legal frameworks involved in the transfer of risk to insurers, pricing of insurance contracts, and principles followed by insurers in selecting risks. *Prereq.* FIN 3812.

FIN 3930 Speculative Markets

Familiarizes the student with all aspects of speculative markets, including options, futures, and options on futures. Uses readings and case problems to study when and how to use speculative market instruments. *Prereq.* FIN 3921.

FIN 3950 Management of Investor Relations

Explores the scope and nature of the investor relations function. Describes various target audiences, reviews financial disclosure requirements, and discusses the effectiveness of various financial communication techniques. Focuses on the workings of the capital markets and the factors affecting a firm's stock price from the standpoint of the investor relations manager. *Prereq.* FIN 3812.

HRM 3301 Organizational Behavior

Serves as a critical component in preparing for increased responsibilities in the management of human resources. Studies leadership, group dynamics, motivation, power, business ethics, organizational structure, and change. Emphasizes practical application of specific skills, theories, and concepts. For nonbusiness majors.

HRM 3760 Managing People in International Settings

Covers basic issues in human resource management relevant to managing in international and cross-cultural environments. Topics include selection and training of personnel for work in multicultural environments, managing the international employee in the United States and abroad, cross-cultural communication, international environments, special issues of concern to small business, and change in multinational companies. *Prereq.* HRM 3815 and HRM 3816.

HRM 3784 Human Resource Management in Health Organizations

Relates the traditional personnel (human resource management) functions: service, audit and control; the new functions: corporate policy formulation planning, advice and counsel, and innovation to the unique problems of health care organizations. Uses union organization and negotiation efforts, in cases and mock negotiation exercises, to focus on the conflicting issues between traditional personnel approaches, and the questioning of management authority and rights by unions and other regulatory policies and agencies. *Prereq.* HRM 3815 and HRM 3816.

HRM 3815, HRM 3816 Behavioral Concepts and Organizational Behavior 1 3 QH each

The first half of this two-course sequence involves major concepts and findings of the behavioral sciences that have particular pertinence to business and administration. Systematic ways of understanding behavior are developed. Specific topics include motivation, interpersonal perception and communication, and small groups processes. The second half of the course sequence relates these basic concepts to specific aspects of behavior in formally constituted organizations. Supervisory behavior is examined in the behavioral context, as well as in relations between groups, in efforts to develop ways of achieving collaboration.

HRM 3817 Organizational Behavior 2

Expands the study of behavior in organizations in order to understand and deal systematically with the complex relationships found in larger organizations.

Provides an opportunity to apply knowledge about people in organizations to the improvement of organizational systems and to the process of achieving changes in organizations. *Prereq.* HRM 3815 and HRM 3816.

HRM 3913 Managing Power and Influence

Explores through cases, readings, and videotape the complex issues involved in the use of power and influence in organizations and how to manage these issues in ways that are organizationally effective and socially responsible. Topics include the dynamics of power within organizations; the methods by which effective managers acquire and maintain power to manage critical dependencies and uncertainties; the important interdependency between power, influence and trust in organizations; analysis and action planning around one's own style of influence and use of power; the effects of these issues upon one's own career. *Prereq.* HRM 3815, HRM 3816, and 15 QH of graduate credit.

HRM 3920 The Management of Innovation

Innovation is the process of turning ideas into useful procedures or products. Students explore what the manager can do to foster, control, and direct innovation to accomplish the company's goals. Topics include the process of innovating, the role of the manager, and the selection of organization designs and systems that are some of the key components of innovation. *Prereq.* HRM 3815 and HRM 3816.

HRM 3945 Training and Developing Human Resources

Aimed at management generalists and human resource specialists who are concerned with maintaining organizational effectiveness through the upgrading of the basic skills and abilities of a broad range of employees. Emphasizes diagnosis of the organization to assess whether training and development is needed; techniques to decide who needs training; developing an awareness of the many types of training methods and their relative strengths and weaknesses for various groups of employees, and problem areas; and the design, implementation, and evaluation of training programs. *Prereq.* HRM 3815 and HRM 3816.

HRM 3948 Organization Development

Studies a recognized management discipline that uses behavioral science knowledge, action research, and specific intervention techniques to implement planned organizational change. Explores the relative advantages of strategies such as team building, process consultation, goal setting, conflict resolution, and structural modification. *Prereq.* HRM 3815, HRM 3816, and 12 QH of graduate credit.

HRM 3949 Management in the 1990s

Global competition, hostile takeovers, corporate restructuring, and downsizing have had a dramatic impact on organizations and the nature of managerial work. This course focuses on the impact of these changes, particularly for middle management. No longer is top management the sole proprietor of corporate strategy, environmental scanning/interfacing,

and internal integration functions. Increasingly, middle managers are becoming actively involved in strategic management, in managing external alliances, and in organizational integration activities. Topics covered include new approaches to strategy implementation, organization design, leadership, motivation, and career management. *Prereq.* HRM 3815 and HRM 3816.

HRM 3952 Dynamics of Interpersonal Communication

Focuses on understanding and developing interpersonal communication skills and their implications for improving individual and group effectiveness in organizations. Explores the factors that influence how we relate to others. Through class discussion, readings, and individual and group projects, students examine effective listening behaviors and small group/conference techniques. *Prereq.* HRM 3815 and HRM 3816.

HRM 3953 Stress and Health in Business

Examines stress and health issues in the workplace. Focuses on the causes and consequences of work-related stress. Identifies management methods that range from individual coping techniques to organizational strategies. Explores health-related topics such as employee fitness, alcohol and drug abuse, mental health, and AIDS. Assists students in developing approaches to stress management in organizations.

HRM 3955 Compensation Management

Covers policies and techniques of wage and salary administration. Allows students to design and implement compensation plans using case data. Covers the technical aspects of developing a successful compensation program such as determining, weighing, and measuring compensable factors; assigning a total value to a job; grade collapsing procedures, reviewing wage and salary surveys; synchronizing internal with external salary structure; setting up "within grade" rate ranges; developing individual and group incentive compensation plans; developing group membership rewards; estimating labor costs; controlling and utilizing the compensation systems and complying with government and union compensation policy. Uses cases and readings in a lecture/class discussion format. *Prereq.* HRM 3815 and HRM 3816.

HRM 3987 Leadership

Studies the processes and responsibilities of leadership in organizations. Uses a contingency approach that focuses on identifying different types of leadership behavior and on relating particular leadership styles to situational factors. Includes text, readings, and cases that allow for application of the concepts discussed and self-assessment techniques that allow the student to evaluate his or her own leadership qualities. *Prereq.* HRM 3815 and HRM 3816.

INB 3910 Managing the Multinational Enterprise

Deals with international operations at the multinational enterprise; the interface between the firm and the international business environment; current issues in United States public policy affecting

international business competition with Japan and with LDCs. *Prereq.* MEC 3809.

INB 3911 Cultural Aspects of International Business

When a firm moves from its home culture to a host culture abroad, managerial issues become more complex. Managers enter negotiations and make contracts with counterparts whose goals and expectations may be quite different. Topics include strategies for assessing national cultures effectively, negotiation techniques, and case analysis of problems in various cultures. Primary focus will be on the perspective of the United States manager abroad with secondary focus on non-United States managers operating in foreign nations. *Prereq.* 15 QH of graduate credit.

MEC 3808 Managerial Economics 1

Presents macroeconomics for business managers. Acquaints students with the general economic environment and its impact on the firm. Topics include income and employment theory; classical, Keynesian, and monetarist models; aggregate demand and supply systems; money and capital markets; business cycles and the firm.

MEC 3809 Managerial Economics 2

Entails the application of microeconomic principles to the business firm and its competitive environment. Uses cases and readings to demonstrate the practical application of economic models in the decision-making process. Covers demand analysis, production and cost analysis, market structure, and pricing practices. *Prereq.* MEC 3808 and MSC 3803.

MGT 3750 Writing for the Professions

Examines the various forms of business communications and offers practical experience in writing business letters, memoranda, case studies, proposals, and reports. When possible, presents speakers from business and industry to address the class on various problems encountered in management and executive level communications. Requires several short (500-word) papers as well as one or two longer reports.

MGT 3834 Strategic Management 1

Focuses on the environment in which strategy must be formulated in profit and nonprofit organizations. Includes techniques of environmental analysis, with particular emphasis on the political-legal, economic, social, and technological environments as they relate to and influence the formulation of strategy. *Prereq.* All required courses with the exception of ACC 3813, HRM 3817, MGT 3835, and MGT 3836.

MGT 3835 Strategic Management 2

Building on the materials presented in MGT 3834, examines strategy formulation. Emphasizes the process by which strategy is formulated in actual business settings, including the influence of personal values on strategy formulation, who actually makes strategic decisions, what environmental and internal information is required to make strategic decisions, and what criteria are used to make the decisions. Considers the role of different management levels in the process. *Prereq.* MGT 3834.

MGT 3836 Strategic Management 3

Compares and contrasts the approaches to strategy implementation in profit and nonprofit organizations. Topics include organizational structure and behavior, long-range planning, control and motivation systems, information systems, and leadership. Considered within the systems framework of organizational strategy. *Prereq.* MGT 3835.

MGT 3915 Business and Professional Speaking

Designed to give the students an opportunity to develop and deliver oral presentations as they apply to various business settings—focus is on formal as well as informal speaking situations. Stresses helping the student develop skills in dealing with a variety of communication situations. *Prereq.* 15 QH of graduate credit.

MGT 3917 Managerial Communication

The ability to communicate effectively is an important dimension of managerial success. This course deals with a variety of communication contexts and emphasizes improving skills in each context. Students may have the opportunity, through simulators and exercises, to develop individual skills.

MGT 3939 United States Competitiveness in a Global Economy

Explores the distinctive problems of formulating and implementing strategy in global businesses. Discusses and analyzes new trends affecting the international competitiveness of United States firms and possible responses. Encourages participants to view problems from the perspective of foreign firms and foreign governments, in addition to those of United States firms and the United States government. Covers a range of economic sectors and countries. Requires students to work on an in-depth project. *Prereq.* MGT 3834 and MGT 3835.

MGT 3940 The Chief Executive Officer

Focuses on the job perspective of the chief executive officer of business organizations. Focuses on presentations by and discussions with chief executives of major companies in the Greater Boston area. Includes case studies and other literature addressing the job, problems, and opportunities of top managers. Enrollment will be limited. *Prereq.* 30 QH of graduate credit.

MGT 3970 Business and Society: Managing Social Issues

Analyzes environmental influences—economic, legal, technical, social, cultural, and ethical—affecting the corporation. Focuses on reconciling the strains generated by these external factors and their impact on managerial decision making. *Prereq.* HRM 3816 and 12 QH of graduate credit.

MGT 3971 Ethics in Management

Is business ethics intrinsically a contradiction in terms? We will examine—through cases, contemporary issues, and theoretical concepts—whether ethical analysis can and should be applied to managerial decisions. While philosophical ideas will be discussed, this is not so much a presentation of those schools of thought or an attempt to establish

prescriptive norms for business. Rather, we will apply moral reasoning to real situations in an effort to decide whether business can conduct itself in ways that are both profitable and proper.

MGT 3973 Business and Government Regulation

Studies the process by which regulations are formulated at the various levels of government and the impact on business: the regulation of prices, safety, environment, energy, and consumer rights. Emphasizes particular industries: transportation, communication, energy, health care, and finance. Attempts to enhance the ability of managers to respond to and deal with government regulation, which today significantly affects most aspects of business.

MGT 3975 Introduction to Health Care Systems

Explores the current state of the system, dealing with its history and process, and describing the parts of the delivery system, the payers, the consumers, the workforce, and the policy implications. Includes comparison of health care systems, lectures, discussions, and readings. Recommended for those entering the field. *Prereq.* 15 QH of graduate credit.

MGT 3976 Cases in Health Care Finance and Operations

Examines decision making in health organizations emphasizing financial considerations, the effect of government regulation, and third party reimbursement policies. Uses frequent case studies to present financial statement analysis, financing decisions and resource allocation, including new program and facility development. Requires students to prepare cases and to take part in class discussions. *Prereq.* ACC 3812 and FIN 3811.

MGT 3977 Health Care Delivery Systems

Introduces graduate management students to the United States health care delivery system by presenting an overview of its parts while providing and understanding of the interrelational dynamics and, at times, conflicting goals. Highlights the interaction between the health care delivery system and the external environment, including the changing viewpoints, issues, and major social trends.

MGT 3986 Health Care Strategic Marketing

Focuses on how health care organizations are increasingly turning to strategic planning and marketing to achieve objectives. Examines the strategic planning process in hospitals and other provider institutions and the complementary activities of marketing personnel. Explores the role of key constituents—such as, patients, trustees, senior managers, and medical staff—in strategic planning and marketing activities showing how the process of competitive analysis and internal organization evaluation and restructuring are key elements for success.

MGT 3991 Legal Aspects of Business

Provides an understanding of the American legal system with an emphasis upon the resolution of corporate legal disputes by means of civil litigation, mediation, arbitration, and the corporate mini-trial. Examines the traditional areas of contract law and tort law as they relate to problems confronting the

modern corporate manager. Scrutinizes the legal structure of the corporation and focuses upon agency issues, computer law, and the preservation of intellectual property. Reviews government regulation of business including anti-trust law and labor law.

MGT 3997 Special Studies in Business

Administration

Offers a special tutorial arrangement between a student and a faculty member for a guided reading, research, laboratory, fieldwork, report, or teaching experience. Recommended for graduate students who desire to do advanced work or carry out special investigation of a problem in business administration not specifically covered in the curriculum. Requires students to petition the Committee on Graduate Study in Business Administration for permission to register for this course. *Prereq.* 15 QH of graduate credit.

MGT 3998 Special Studies in Business

Administration

See MGT 3997 for course description.

MGT 3999 Special Studies in Business Administration

See MGT 3997 for course description.

MKT 3301 Marketing

An organization's link to its market is a crucial aspect of the management process. This course begins with market analysis and market research and builds on the planning framework examining product, pricing, advertising, sales management and distribution. For nonbusiness majors.

MKT 3760 International Marketing

Helps students develop understanding of the opportunities and challenges facing the international marketing executive; the decision-making process in marketing goods abroad; and the environmental forces—economic, cultural and political—affecting the marketing process in the international marketplace. Includes lectures, discussions, reports, and cases. *Prereq.* MKT 3812.

MKT 3811 Marketing Management 1

Presents the student with a comprehensive examination of basic marketing functions, institutions, and concepts; and helps develop the student's ability to analyze and make recommendations about business problems that involve the creation, distribution, and sale of goods and services. Emphasizes the definition of marketing problems, demand analysis, consumer analysis, and marketing research.

MKT 3812 Marketing Management 2

Continues MKT 3811, with emphasis on the formulation and implementation of marketing strategy. Stresses product policy, channels of distribution, pricing, advertising, personal selling, and the development of integrated marketing programs of action. *Prereq.* MKT 3811.

MKT 3914 Consumer Behavior

Offers development of an understanding of consumer attitudes and behavior processes. Examines and evaluates various economic and behavioral models

of consumer behavior as bases for the planning and evaluation of marketing strategies. *Prereq.* MKT 3812.

MKT 3916 Workshop in Negotiating

Helps improve the students' understanding of the negotiations process and their ability to plan and conduct negotiations effectively. Involves readings, lectures, and discussions as well as numerous case discussions and live and videotaped role-play negotiation exercises. *Prereq.* MKT 3812 and HRM 3816.

MKT 3922 Brand Management

Emphasizes the process of new consumer product development, the management and development of product strategies, and management of the product mix in the multiproduct firm. Topics include identification and screening of new product opportunities, evaluation of product performance, segmenting the product market, diversification and simplification of the product line, and the management of innovation. *Prereq.* MKT 3812.

MKT 3926 Advertising Management

Explores management of the advertising function from the perspective of users such as product managers. Uses case studies and text materials to explore the role of advertising, target market identification, creative strategies, media planning, and advertising evaluation. Emphasizes coordination of advertising with marketing elements and overall corporate strategy. *Prereq.* MKT 3812.

MKT 3931 Marketing Research

Discusses major methods of marketing research. Emphasizes research design issues—sampling, data collection procedures, and questionnaire construction—rather than data-analysis procedures. Examines sources of error in surveys in detail, along with the appropriate methodological techniques designed to reduce their magnitude. Evaluates surveys in terms of their ability to provide quality information. *Prereq.* MKT 3811 and MSC 3802.

MKT 3932 Statistical Methods for Marketing Research

Focuses on various statistical methods of design and analysis in marketing research. Topics include nonparametric statistics, experimental design, correlation and regression analysis, multiple discriminant analysis, and factor analysis. Uses canned statistical programming routines with actual survey data to illustrate the application of the methods discussed. This course may be taken independently of MKT 3931. *Prereq.* MKT 3811 and MSC 3802.

MKT 3934 New Product Development

The importance of new products to the survival and prosperity of firms increases as product life cycles become shorter, as technology, competition, and consumer tastes change; and as operating costs increase. For most firms, coping with the problems of environmental change through modification of the product line is vital and difficult. This course will have as a primary concern the examination and analysis of some of the problems firms face in directing and managing

their new product development activities. *Prereq.* MKT 3812.

MKT 3936 Retail Management

Analyzes the evolution of retail institutions and examines selected major strategy and policy problems of food, apparel, and general merchandise retailers. Explores cases and issues from the viewpoint of the managements of supermarket, department store, specialty store, and discount enterprises. Designed primarily for students interested in retailing and those concerned about the role of mass distributors in marketing consumer goods. *Prereq.* MKT 3812.

MKT 3940 Defense Marketing

Conducted in a seminar format, with emphasis upon defense marketing in its totality, including analysis of participant roles, contractual foundations, contractor performance, and marketing activities. Topics include the overall defense acquisitions process, market characteristics, program management, procurement methods, sales and negotiation techniques, and related marketing management factors. *Prereq.* MKT 3812.

MKT 3941 Industrial Marketing

Considers the problems of industrial concerns in marketing products and services to industrial, business, and organizational customers. Emphasizes determining customers' needs and developing programs to satisfy these needs. Topics include the roles and responsibilities of the marketing executive engaged in industrial distribution advertising and research, as well as roles and responsibilities of industrial salespeople, sales supervisors, and selling agents. *Prereq.* MKT 3812.

MKT 3945 Sales Management

Helps develop the decision-making skills necessary to build and maintain an effective sales organization. Uses cases and readings to examine the strategic and operating problems of the sales manager. Topics include the selling function; sales management at the field level; the sales executive; and sales and marketing management. *Prereq.* MKT 3812.

MKT 3952 Marketing for Nonprofit Organizations

Explores the extension of marketing concepts, practices and principles to organizations outside the business sector. Applies marketing methods to nonprofit organizations such as governmental agencies, educational institutions, charitable organizations, social cause agencies, and political candidates. Emphasizes the development of integrated marketing plans for the various nonprofit organizations. *Prereq.* MKT 3812.

MKT 3955 Marketing in High-Tech Industries

Offers study for students who already have a good background in marketing but who are now interested in analyzing the special marketing problems that high-tech industries pose. Topics include the use of market research when customer preferences are not yet developed, the use of sales and service forces, and the use of marketing as a strategic variable. *Prereq.* MKT 3811.

MKT 3966 Marketing in the Service Sector

Deals with public and private profit and nonprofit institutions which market services. Includes insurance, transportation, utilities, entertainment, health care, education, religious, sports, banking, artistic, and protective. Combines case discussions, textbooks, and outside readings for a balanced approach for the development of marketing skills. Defines, classifies, and analyzes service characteristics from the perspective of their effect on marketing methods and institutions. *Prereq.* MKT 3812.

MKT 3975 Health Care Marketing

As the health service environment becomes increasingly competitive and complex, health service organizations use sophisticated marketing tools to identify and manage marketing opportunities and distribution strategies. Students will examine different health service marketing applications in the context of service marketing through case analysis, readings, and a project. Specific marketing techniques will be addressed within a strategy framework. *Prereq.* 15 QH of graduate credit.

MKT 3978 Competitive Strategy

Serves as a capstone course for graduate students emphasizing the marketing area in their studies. Pulls together the various functional, institutional, and strategic elements that marketing comprises and to which the student has been exposed in previous coursework. *Prereq.* MKT 3812.

MSC 3301 Operations

Explores the strategic nature of operations planning. Stresses capacity planning, quality control, product liability, production scheduling and control. Highlights the interdependence of sound financial planning, effective marketing strategies and corporate decision making. For nonbusiness majors.

MSC 3780 Operations Management in Health Care Organizations

Hospitals and other health services organizations provide costly, varied, and sophisticated human and capital resources to maintain and improve the lives of those served. The operations management function in health organizations encompasses planning, coordinating, and controlling these complex resources in order to satisfy, at reasonable costs, current and anticipated client needs. The concepts, tools, techniques, applications, and cases appropriate to a discussion of the planning and control of efficient, effective, and equitable health services organizations are presented. Topics include capacity planning, facility location, forecasting, process and job simulation and quality control. Designed for individuals interested in careers in health care administration. *Prereq.* MSC 3805.

MSC 3802 Quantitative Analysis 1

Examines the process of statistical inference, whereby the analyst is enabled to infer or draw conclusions about the parameters of a large data set on a basis of sample statistics. Topics include the generation of subjective probabilities, the revision of

probabilities to incorporate new information, and the incorporation of probabilities into the decision-making framework.

MSC 3803 Quantitative Analysis 2

Introduces the theory and practice of management science. Discusses regression analysis, linear programming, and simulation in text and case material. Stresses practical application of the techniques. Considers problem definition, model building, relevant cost determination, solution generation, and implementation of results. *Prereq.* MSC 3802.

MSC 3805, MSC 3806 Operations Management 1, 2**3 QH each**

Helps develop an understanding of the management of operating systems. Examines the design, operation, control, evaluation, and modification of systems that produce goods and services. Attempts to increase the student's decision-making capabilities in technical areas and develop an appreciation for the operations manager's job, and provide an understanding of interrelations with other functional areas. Topics include design of product and process, capacity planning, line balancing, work measurement, job evaluation, network scheduling, production planning, inventory management, production scheduling and control, and quality control. MSC 3805 concentrates on the design of the operating system; MSC 3806 focuses on its operation and control. *Prereq.* For MSC 3806, MSC 3803.

MSC 3832 Introduction to Computer Applications

Provides a business-oriented introduction to data processing functions and systems. Introduces history, terminology, technology, and economics of data processing hardware and software. Considers management issues in the design, selection, evaluation, and use of computers and computer services. Offers individual familiarization with personal computers and popular business software. *Prereq.* Satisfactory completion of computer programming requirement.

MSC 3909 Quality Management and Control

Focuses on the need for quality assurance in both the manufacturing and service sectors, the technical and statistical tools used in quality assurance, and the concept of total quality. Topics include the history of quality assurance in the United States and Japan; managerial issues related to quality assurance, including the concept of total quality control, the role of quality as a strategic tool, and human resource factors in the management of quality; and managing and controlling quality in service industries. *Prereq.* MSC 3802.

MSC 3911 Manufacturing Policy

Focuses on strategic operating decisions typically addressed by the vice president of manufacturing operations, such as capacity expansion, the impact of new products and/or processes, product allocation to plants, and vertical integration. Emphasizes how these decisions impact the competitive position of a firm both now and in the future, which helps the students understand the totality of a top management situation where the interactions between corporate

and manufacturing strategies are most evident. Includes case studies, reference notes, and articles. Recommended for students who currently are in, or expect to be in, positions of major responsibility in manufacturing/operations, and also for students who must possess the qualifications to analyze the manufacturing capabilities of companies, such as those in investment banking, finance, and consulting. *Prereq.* MSC 3806.

MSC 3914 Performance Criteria and Incentive Systems

Presents the stages required for implementing an effective performance criteria system in an organization: selecting performance criteria, measuring performance, and establishing standards. Describes various financial incentive systems to increase motivation for improved performance. Reviews individual, group, and organizational incentive systems. Participants may be able to design and implement systems by the end of the quarter. *Prereq.* MSC 3805.

MSC 3933 Management Information Systems

Deals in depth with the analysis, design, implementation, and operation of modern management information systems. Uses case studies as the primary vehicle to illustrate all phases in the creation and management of computer-based systems. Emphasizes management issues rather than computer technology or programming. Designed to follow MSC 3832, this is a logical second computer course that an MBA candidate might take. *Prereq.* MSC 3832.

MSC 3936 Database Management Systems

Provides management-oriented introduction to database management systems (DBMS). Topics include rationale for the DBMS approach, database design, data models, DBMS software tools, conversion to a database environment, and the role of the database administrator. Allows students to use a

DBMS package, gain experience in database design, use a query language, and develop DBMS applications. *Prereq.* MSC 3832.

MSC 3940 Data Communications for Managers

Presents a nontechnical introduction to data communications for the general manager. Improves the manager's knowledge of critical aspects of this rapidly expanding and increasingly important field. Surveys the most important aspects of modern local and remote communications systems. Topics include fiber optics, microwave transmission, networking, and switching. Gives students the opportunity to design several prototype communications configurations. *Prereq.* MSC 3832.

MSC 3963 Expert Systems

Familiarizes the student with the potential of expert systems (ES) for management problem-solving. Topics include the position of ES in the larger field of artificial intelligence, components of an ES, various levels of languages for ES construction, determination of problem areas suitable for the application of ES technology, analysis of several existing ES applications, and future potential for this technology. Uses case and readings. Teaches one of the most popular ES languages. Includes a project on one of several aspects of ES application. *Prereq.* MSC 3832 or MSC 3933.

TRN 3903 Corporate Transportation/Logistics

Focuses on the design and management of corporate transportation and logistics systems. Emphasizes the analytical framework which is employed in making complex distribution tradeoffs. Topics include inventory control, location analysis, transportation planning, and the integration of logistics planning with other functional aspects of the organization. *Prereq.* 15 QH of graduate credit.

Graduate School of Computer Science

All courses carry four quarter-hours of credit unless otherwise specified. All courses have COM 1201 Data Structures as a prerequisite, in addition to those listed.

COM 3112 LISP 2 QH
Introduces computer scientists to LISP, emphasizing the use of LISP in artificial intelligence.

COM 3114 C/UNIX Laboratory 2 QH
Introduces C programming language. Studies reading and writing the language, learning to use UNIX commands and application programs, and UNIX system calls and subroutines.

COM 3115 PROLOG 2 QH
Covers PROLOG syntax, data structures, backtracking and “cut”, debugging, applications, and the relation of PROLOG to logic.

COM 3200 Computer Architecture
Studies the design of digital computer system components, including the arithmetic and logic unit, the control unit, the memory and memory controller, and interconnection networks. Explores modern design techniques for increasing computer system capacity. Topics include pipelining, cache, RISC architecture model, multiprocessing and parallel processing architectures, systolic arrays, dataflow architecture, and associative memories. *Prereq.* COM 3336.

COM 3205 The Software Life Cycle
Presents a comprehensive review of the software development field. Examines the “software crisis” and the need for methods and software lifecycle paradigms such as waterfall, prototyping, executable specifications, and incremental development. Discusses requirements analysis, specification methods, software design principles and methods and software verification testing. Explores project management, cost estimation, metrics, implementation issues, document design, and maintenance. Emphasizes data abstraction and module integration. Includes a project covering the requirements specification, design, and coding phases of software development. Provides initial documentation that is text-based, with CASE tools introduced later.

COM 3210 Software Specification, Design, and Maintenance
Focuses on issues of documenting and modifying large programs, possibly written by others. Uses CASE tools for analyzing and documenting a large software system. Emphasizes differing design representations and conveying the inner working of a complex software system. Reviews data abstraction and object-oriented programming. Emphasizes also debugging tools, including dbx, make, lint, tags, and RCS, or their equivalent in a non-UNIX environments. A typical project generates CASE-based documentation for preexisting software and uses the documentation to design and add enhancements. *Prereq.* COM 3205.

COM 3220 Software Testing, Verification, and Validation
Studies unit testing, including functional testing and its relationship to the specification, structural testing, and error-oriented testing and analysis. Discusses

managerial aspects of unit testing and analysis. Examines verification and validation, including objectives, theoretical limitations, integration and system testing, and regression testing. Considers simulation and prototyping, requirements tracing, proof of correctness, code reviews, and planning for verification and validation. Reviews formal verification methods, including Hoare logic, weakest preconditions, and others. *Prereq.* COM 3205.

COM 3315 Database Systems
Considers the concepts and structures necessary to design and implement a database application. Introduces database concepts and database modeling. Emphasizes the relational model, but may also discuss older models such as the hierarchical and network models as well as the newer object-oriented model. Topics include data definition and manipulation languages, and design theory for relational models. Introduces access methods, query optimization, integrity, security, recovery, and concurrency in database systems.

COM 3316 Physical Database Engineering
Studies specifying, designing, and implementing database management systems in a centralized setting. Discusses the access characteristics of secondary storage devices and analyzes primary and secondary access methods for performance of database operations and for storage. Topics may include query optimization methods, hashing techniques, search structures, sorting methods, incremental reorganization, and recovery and concurrency. *Prereq.* COM 3315.

COM 3317 Data Modeling
Presents the theoretical foundations of existing and proposed database systems. Considers the semantics of database systems and data modeling. Develops the theory of normalization. Discusses logic databases, knowledge bases, and object-oriented databases. *Prereq.* COM 3315.

COM 3329 Topics in Database Management
May be repeated for credit. *Prereq.* Permission of instructor.

COM 3336 Operating Systems I
Introduces the basic structure, components, design, implementation, and internal operation of computer operating systems. Includes the history of operating systems, user interface, I/O device management, device drivers, process environment, concurrent processes and synchronization, interprocess communication, process scheduling, memory management, deadlock management and resolution, and file system structures. Includes examples from real operating systems. A lab exposes students to the system concepts through programming exercises. *Prereq.* COM 3114.

COM 3337 Operating Systems 2

Continues COM 3336. Includes advanced topics such as security and access control, object and capability-based systems, multiprocessor support, fault-tolerant systems, transaction processing systems, and distributed operating systems. Includes examples from real operating systems. Lab exercises include programming and modifying operating system components. *Prereq.* COM 3336.

COM 3349 Topics in Operating Systems

May be repeated for credit. *Prereq.* Permission of instructor.

COM 3350 Theory of Computation

Studies partial recursive functions, primitive recursive functions, recursively enumerable sets, Turing decidability, and unsolvable problems. Discusses the classes P and NP, and some NP-complete problems. *Prereq.* COM 3390 and either COM 1350 or COM 3710.

COM 3351 Principles of Programming Languages

Considers the basic components of programming languages, including specification of syntax and semantics. Presents the derivation of language processors from their specifications, and describes programming language features. Includes examples from a variety of languages.

COM 3355 Compiler Design

Explores the basic components of compilers, with an emphasis on using a standard compiler-writing tool such as yacc, tws, or ssl. Thus, parsing is not a major part of this course. Writing a small compiler using the compiler-writing tool may be required. Topics include an overview of the stages of compilation, attribute grammars, symbol tables, abstract syntax trees, run-time structure, and code generation. *Prereq.* COM 3351.

COM 3356 Optimizing Compilers

Studies the code generation phase of compilers, with emphasis on production of efficient object code. Topics include immediate code representations, flow analysis, local and global optimization, peephole optimization, register allocation, and methods for code generator generation (table-driven code generation, Graham-Glanville techniques, etc.). *Prereq.* COM 3355.

COM 3357 Semantics of Programming Languages

Offers the mathematical models for the behavior of programming languages, including reading and writing denotational specifications. Considers the lambda-calculus, and emphasizes the practical use of the techniques covered, such as rapid prototyping and debugging specifications. *Prereq.* COM 3351.

COM 3360 Object-Oriented Systems

Discusses the basic components of object-oriented systems: programming languages that support the object-oriented paradigm, object-oriented databases, and their interfaces. Considers methodologies for developing applications with object-oriented systems, as well as the design space for object-oriented

programming languages. Reviews the maintenance and evolution of object-oriented applications. Includes programming assignments using a widely available object-oriented programming language. *Prereq.* COM 3351.

COM 3370 Advanced Computer Graphics

Discusses selected topics chosen from the following list: area fill algorithms, aliasing problem in line drawing, three-dimensional graphics, geometric transforms, hidden surface algorithms, curve and surface approximation techniques, solid primitives, color and shading, approaches to obtaining realistic images. *Prereq.* An introductory course in computer graphics.

COM 3371 Digital Image Processing

Studies the fundamental concepts of digital image processing, including digitization and display of images, manipulation of images to enhance or restore image detail, encoding (compression) of images, detection of edges and other object features in images, and the formation of computed tomography (CAT scan) images. Introduces mathematical tools such as linear systems theory and Fourier analysis and uses them to motivate and explain these image processing techniques.

COM 3390 Analysis of Algorithms

Presents mathematical techniques for analyzing time and space performance of computer algorithms. Focuses on the application of these techniques to designing efficient algorithms. Topics include asymptotic notation, recurrences, lower bounds for worst case and average case, hashing, dynamic programming, and NP-completeness. *Prereq.* Discrete mathematics, MTH 1137, or equiv.

COM 3399 Topics in Programming Languages and Systems

May be repeated for credit. *Prereq.* Permission of instructor.

COM 3410 Foundations of Artificial Intelligence

Studies searching, goals, plans, and heuristics. Examines representation of knowledge, including frames, nets, and inheritance. Explores logic and its role in artificial intelligence, and selected applications of these ideas in other areas of artificial intelligence. *Prereq.* Working knowledge of LISP (same as MTH 3522).

COM 3411 Methods of Artificial Intelligence

Offers hands-on experience in developing and using AI tools such as search with backtracking (chronological, dependency-directed), heuristic search, blackboard models, inference engines, default reasoning, object-oriented programming, procedural attachment, plan-generate-test in problem solving, production systems, and augmented transition networks. *Prereq.* COM 3410.

COM 3420 Knowledge Representation and Inferencing

Explores current theories and research issues in knowledge representation. Topics include non-monotonic logic; Bayesian inference networks; logics of time, knowledge, and action; the Dempster-Shafer theory of evidential reasoning; qualitative physics;

and analogical reasoning. Emphasizes critical reading of research material and comparing different approaches. *Prereq.* COM 3410 and COM 3411.

COM 3430 Expert Systems

Introduces expert systems and how to build them. Focuses on techniques and tools, classical systems, and research in automated methods. Assignments introduce students to various languages and tools. Requires a project or term paper. *Prereq.* COM 3410.

COM 3440 Natural Language Processing

Investigates the goals and problems of Natural Language Processing (NLP) and studies the grammatical models and associated parsing algorithms. Considers models of natural language semantics: case grammar, semantic networks, formal logic, and frames. Discusses current research on models of discourse, speech act planning, and robust parsing methods. Examines some implemented systems for NL understanding. *Prereq.* COM 3410.

COM 3450 Intelligent Pattern Recognition

Studies the relationship between pattern recognition and artificial intelligence. Concentrates on learning (supervised versus unsupervised); different approaches to pattern recognition (statistical, syntactical, and structural); multi-dimensional models for object recognition; and application to industrial, banking, engineering, and medical areas. *Prereq.* *Discrete mathematics* and COM 3410.

COM 3470 Computer Vision

Discusses low-level vision. Develops methods that assemble the low-level elements into coherent wholes based on models of scenes using world knowledge in the appropriate domains. Topics include classification, robot vision, moving image analysis, and cognitive models of vision (gestalt effects, texture perception, subjective contours, illusions, apparent motion and mental rotations, cyclopean vision, etc.). *Prereq.* *Linear algebra* and COM 3114 or equiv.

COM 3480 Connectionist Models of Learning

Introduces connectionist (neural network) approaches to machine learning and problem solving. Covers mapping, settling, and sequential networks; back-propagation and other supervised learning methods; unsupervised and reinforcement learning methods; stochastic networks and simulated annealing; models of associative memory and other cognitive processes; task representation and computational issues. *Prereq.* COM 3410.

COM 3499 Topics in Artificial Intelligence

May be repeated for credit. *Prereq.* *Permission of instructor.*

COM 3510 Computer Communications Networks

Explores data networking, focusing on concepts, technology, and implementation issues. Discusses distributed system requirements, network architectures, OSI model, communications protocols, routing algorithms, local area networks, public data networks, PC networks, vendor network architectures, standards, internetworking, network management,

and performance issues. Examples from real networks, including SNA, DECnet, Ethernet, Token Ring, and X.25. *Prereq.* COM 3336.

COM 3520 Cryptography

Presents the design and use of cryptographic systems and cryptanalytic attacks and provides a history of cryptographic systems and the mathematics behind them. Considers shift register sequences, random number generators, DES, as well as public key systems and their applications. *Prereq.* MTH 1137 or equiv. and either COM 1350 or COM 3710.

COM 3560 Distributed Database Systems

Addresses the problems and opportunities inherent in high-performance and distributed database systems. Considers methods for concurrency control and recovery management, methods for improving performance and availability, and managing replicated data. *Prereq.* COM 3315 and C/Unix experience.

COM 3630 Concurrent Programming

Explores the logical problems that arise in concurrency and their machine implementations. Considers mutual exclusion, message passing, deadlock, monitors, kernels, and applications to operating systems. *Prereq.* COM 3336.

COM 3640 Parallel Algorithms

Studies various models of parallel machines and the computer architectures needed to implement them. Explores algorithms and theories for parallel computation on the various models of parallel machines. Focuses on algorithms for sorting, combinatorial and numerical problems, graph algorithms, matrix multiplication, and FFT. *Prereq.* COM 3390.

COM 3699 Topics in Computer Architecture and Hardware

May be repeated for credit. *Prereq.* *Permission of instructor.*

COM 3710 Automata and Formal Languages

Examines formal models of computation, including finite state automata, push-down automata, and Turing machines. Discusses the properties of regular sets and context-free languages. Addresses aspects of computability and undecidability. Same as MTH 3521. *Prereq.* *Discrete mathematics*, MTH 1137, or equiv.

COM 3730 Complexity Theory

Presents the theory of relationships among complexity classes of algorithms, especially those arising from studying time- and space-bounded computations. Examines sequential, deterministic, parallel, nondeterministic, and probabilistic models of computation, as well as Turing and decision tree models. Considers the class NP, and addresses questions of completeness, especially NP-completeness, reducibility, and hierarchy of complexity classes. Same as MTH 3535. *Prereq.* COM 3350.

COM 3741 Algebraic Algorithms

Offers topics in algebraic algorithms chosen from the following list: computational group theory, computational number theory, algorithms for computing with finite fields, and the discrete Fourier Transform and

its applications. Other topics may include the Knuth-Bendix algorithm for finitely presented algebras, polynomial factorization, and related topics in computer algebra. Same as MTH 3514.

COM 3761 Numerical Analysis 1

Surveys the problems, issues, and techniques of numerical analysis. Considers problems such as root finding, curve fitting, numerical integration, large linear systems of equations, and ordinary differential equations. Addresses such issues as tradeoffs, for example, cost versus precision and speed versus space. Requires some programming. Same as MTH 3361. *Prereq. FORTRAN or Pascal.*

COM 3762 Numerical Analysis 2

Studies the numerical solution of partial differential equations, emphasizing elliptic equations and the finite element method. Same as MTH 3362. *Prereq. COM 3761.*

COM 3799 Topics in Theoretical Computer Science

May be repeated for credit. *Prereq. Permission of instructor.*

COM 3800 Readings in Computer Science

Offers selected readings under the supervision of a faculty member. *Prereq. Core courses and permission of instructor.*

COM 3805 Readings in Computer Science 2 QH

Requires selected readings under the supervision of a faculty member. *Prereq. Core courses and permission of instructor.*

COM 3810 Special Topics in Computer Science

Faculty will lecture on current topics in computer science. Topics will vary from quarter to quarter. May be taken up to three times for credit, with changes in topics. *Prereq. Core courses or permission of instructor.*

COM 3820 Computer Science Master's Thesis

May be repeated for credit. *Prereq. Agreement of a thesis adviser.*

COM 3821 Computer Science Master's Thesis

0 QH

Continues COM 3820.

COM 3830 Computer Science Master's Project

May be repeated for credit. *Prereq. Agreement of a project supervisor.*

COM 3840 Seminar in Computer Science

Provides an opportunity to read and present various survey and research papers in computer science. Faculty supervisor and topics will vary from quarter to quarter. May be repeated for credit. *Prereq. Core courses or permission of instructor.*

COM 3890 Computer Science Doctoral Thesis

0 QH

COM 3891 Computer Science Doctoral Thesis

0 QH

Continues COM 3890.

Graduate School of Criminal Justice

The following course descriptions are representative of the courses offered in the Graduate School of Criminal Justice. As it is not possible to offer all courses each year, students are urged to consult the most current announcement of course offerings for specific information regarding available courses in any given quarter. All courses described here carry three quarter-hours of credit except as noted.

CJ 3201 The Criminal Justice Process

Introduces students to the operation of the criminal justice system. Covers the components of the system, the process by which defendants are moved through that system, and key issues in the administration of criminal justice.

CJ 3202 Theories of Criminology

Focuses on scientific methods used in analyzing patterns and causal factors related to crime, the criminal, and social reactions to both. Explores critical contributions to the study of crime, criminals, and the treatment of offenders from disciplines such as biology, psychology, economics, psychiatry, endocrinology, law, sociology, and anthropology.

CJ 3203 Criminal Law

Discusses the fundamental principles, concepts, and development of criminal law and the constitutional provisions that govern it. Focuses on the relationship of the individual to the state and examines the general framework of criminal law as a means of social control.

CJ 3251 Criminal Justice Planning and Development

Provides an overview of strategic and organizational planning. Focuses on developing criminal justice strategy as an executive function. Introduces concepts such as organizational strategy and its elements, environmental scanning, market analysis, competitor analysis, forecasting, and organization for strategic and organizational planning. Relates these concepts to the context of criminal justice functioning. Explores planning as a staff function and servicing strategy.

CJ 3252 Criminal Justice Management

Provides an overview of implementing and maintaining organizational strategy. Defines strategy and its elements. Relates concepts such as leadership, structure, organizational culture, administrative processes, budgeting, and personnel processes to criminal justice agencies and functioning. Introduces both project and organizational management.

CJ 3253 Personnel and Labor Relations in Criminal Justice

Examines collective bargaining in the public and private sectors. Explores public/employee unionism and its fit into the American economic, political, and social systems. Discusses the fundamental principles of personnel management, including the development of human resources, personnel recruitment, selection, performance evaluation, compensation, the disciplinary process, and leadership. Studies the social psychology of organizations in law enforcement, the courts, and corrections. Explores in-depth critical employee motivation issues, labor relations, and collective bargaining.

CJ 3254 Budget and Financing in Criminal Justice

Introduces the ways in which budget and financial management systems can be used to advance the strategic objectives or repositioning of criminal justice organizations. Covers basic concepts and techniques that general or project managers need to understand, including financial analysis, budgeting, overhead, grant writing, control systems, and cost effectiveness. Explores budget and finance from a strategic rather than an accounting point of view.

CJ 3301 Administration of Private Security

Examines private security theories, operations, and practices, with special emphasis on the administration and management of security. Considers the philosophical background, history, and current role of private security, as well as the role and status of the security manager in threat assessment, risk prevention, and the protection of assets. Discusses functional-area security systems, law, science and technology for security, and issues, standards, goals, and challenges for the future. Studies security systems, particularly as they relate to criminal justice and the environment.

CJ 3302 Law and Private Security

Studies the legal factors that affect security operations and administration and the value of legal counsel. Discusses factors such as the pertinent aspects of torts, agency, civil rights, contracts, trade secrets, insurance, and regulatory issues.

CJ 3303 Technological Security Systems

Considers security applications of the latest scientific and technological advances and the impact of new product developments on prevention and protection, detection, and prosecution. Examines state-of-the-art security products and planning, implementing, maintaining, and evaluating highly sophisticated security systems.

CJ 3351 Theories of Law and Society

Introduces theories, issues, and research related to law and legal institutions, placing law in the context of social control systems, raising basic issues about the nature of law, and focusing on the relationship between law and social values. Considers the nature of law, law and social change, the sociology of the legal profession, and criminal law in action.

CJ 3352 Statistical Analysis 2

Covers criminal justice data analysis using multivariate approaches, including multiple regression and factor analysis. Emphasizes the use of statistical software and graphics in data analysis. *Prereq. CJ 3534.*

CJ 3354 Criminal Behavior Systems

Examines sociological approaches to the study of particular crime types and research findings on specific criminal behavior systems. Requires students to explore a particular criminal behavior system in depth.

CJ 3505 Juvenile Law and Children's Rights

Examines the legal relationship between the juvenile offender and the state. Covers case and statutory law, as well as constitutional due-process standards in juvenile proceedings. Topics include jurisdiction, prejudicial process, waiver of jurisdiction adjudication, disposition, and postdispositional issues, as well as the right to treatment.

CJ 3508 Quantitative Models in Criminal Justice

Explores quantitative frontiers in the criminal justice field, as well as the methodological contributions of allied fields including operations research, economics, and geography. Discusses such approaches as models of recidivism, stochastic models of criminal behavior, and econometric models of deterrence.

CJ 3509 Crime Measurement

Analyzes the amount, distribution, and pattern of criminal behavior in the United States via official crime statistics including the Uniform Crime Reports, victimization surveys, and self-report studies. Reviews alternative measures including indices of seriousness of various offenses. Examines historical studies of the nature and extent of criminal behavior, and discusses problems and prospects regarding accurate measures of crime and crime correlates.

CJ 3511 Theories of Delinquency

Examines critically the major theoretical explanations of juvenile delinquency, including social disorganization, subcultural theory, strain, control theory, labeling, and conflict theory. Discusses current data on the nature and distribution of delinquency, highlighting findings from empirical research.

CJ 3512 Penology and Corrections

Focuses on the major problems and issues in the American correctional system. Covers theories of punishment, types of punishment, the history of and conditions in institutions for juveniles, men, and women. Considers the crisis in overcrowding brought on by recent sentencing reforms.

CJ 3513 Victimology

Examines critically theories and research regarding victims of crime, giving special attention to National Crime Survey victimization data. Discusses the fear of crime, victim vulnerability, and victim culpability. Assesses the implications of victim-oriented research for the administration of justice, as well as current programs offering victim services such as restitution and compensation. Analyzes future trends in theory, research, and public policy.

CJ 3514 Police Functions in Democratic Society

Examines the sociopolitical context within which American police departments have developed, as well as the changing forces that shape modern departments. Considers the implications of democratic institutions and traditions for policing in America. Contrasts the organization of different types of police departments and examines the implications of these different organizations on police performance.

CJ 3515 Gender and Justice

Examines ways in which criminology, the criminal justice system, and the law contribute to the social construction of gender. Investigates processes through which females are encouraged to become "girls" or "women" by cultural assumptions about female deviance, discourses on female crime, the criminal justice system, and legal assumptions about the meaning of equality. Focuses on feminist approaches to criminal justice that parallel the new feminist jurisprudence.

CJ 3516 Court Administration and Management

Examines the problems, policies, and practices of the criminal court system in the United States. Addresses topics such as the structure and organization of the court system and the role that criminal courts play from arrest to conviction. Emphasizes the lower criminal court and issues concerning court management, including personnel, juries, witnesses, and scheduling.

CJ 3517 Terrorism

Examines the sociological, psychological, and economic aspects of national and international terrorism. Investigates funding for terrorist movements, intelligence gathering, weapons and tactics, informers, and counter-measures. Analyzes the "terrorist personality," the literary depiction of terrorism, the doctrines of global terrorism, and terrorism as surrogate warfare. Explores current interpretations, common patterns, motives, and goals of terrorist movements. Concentrates on identifying root causes and discusses technologies of counter-terrorism, incident management, and risk management at the international, national, and local level. Explores the terrorist victim experience and challenges existing assumptions concerning terrorism.

CJ 3524 Theories of Punishment

Introduces theories and issues in punishment with a focus on topics of contemporary interest as well as their historical roots. Considers trends and fashions in both the theory and the form of punishment. Draws reading materials from a variety of fields, including philosophy, politics, literature, and law.

CJ 3525 Correctional Administration

Offers intensive coverage of the many problems and dilemmas that confront the correctional organization. Topics include the basic problems of correctional organization, organizational development and analysis, management by objectives, planning and budgeting systems, management style and personnel development, special problems of jails and houses of corrections, institutional programs, classifications, correctional policy, and the future of imprisonment.

CJ 3528 Current Issues in Criminal Justice

Explores a topic in the field of criminal justice. Subject matter changes each quarter.

CJ 3531 White-Collar Crime

Examines critically the current theoretical, research, and public policy issues regarding white-collar crime. Explores definitions of white-collar crime as well as

various typologies of white-collar crime activity. Assesses the nature, extent, and consequences of white-collar crime nationally and internationally. Discusses explanations for the commission of these offenses as well as the problems of traditional criminal justice systems in controlling white-collar crime. Assesses the prospects of alternative systems of control: civic law, private security, and public opinion.

CJ 3532 Computer Applications in Criminal Justice 4 QH
Introduces microcomputers in a network-based environment through lectures and laboratories. Covers the MS-DOS operating system and basic software approaches, including word processing, spreadsheets, and database applications.

CJ 3533 Research and Evaluation Methods 4 QH
Surveys the basic techniques of research and evaluation methods. Addresses various research strategies, including surveys, observation, archival data, experiments, and evaluation designs. Covers issues such as ethical problems and the design, procedures, and politics of research.

CJ 3534 Statistical Analysis I 4 QH
Introduces probability and statistical analysis. Topics include measures of central tendency and dispersion; probability and probability distributions; sampling distributions and hypothesis testing; and correlation, regression, and forecasting.

CJ 3801, CJ 3802 Directed Study 1, 2 3 QH each
Offers the student the opportunity to bring individual, concentrated attention to a particular topic as arranged and agreed upon in advance by a faculty member and the student. This option is generally recommended when the student desires a more intensive analysis of a particular subject. *Prereq. Permission of graduate school director.*

CJ 3803, CJ 3804 Internship 1, 2 3 QH each
Field placement in a criminal justice agency involving instruction may be offered through administrative, research, teaching and/or related activities. Students have the opportunity to apply theoretical concepts in a practical, applied fashion by observing and contributing to the daily activities of operating agencies and organizations. *Prereq. Permission of graduate school director.*

CJ 3805 Master's Thesis 6 QH
Students electing to write a master's thesis must select a thesis topic with the advice of a faculty member and receive approval of the thesis topic from the graduate director. *Prereq. Permission of graduate school director.*

Graduate School of Engineering

Chemical Engineering

Each course description includes information on the quarter in which classes are usually offered. The quarters listed are presented for planning; however, the Graduate School of Engineering cannot guarantee that all courses will be offered. Students must refer to the Graduate School of Engineering Quarterly Course Offering sheets to determine what courses are actually offered in any given quarter.

CHE 3300 Chemical Engineering Mathematics 4 QH **Fall Quarter, Alternating Years**

Presents formulation and solution of problems involving advanced calculus as they arise in chemical engineering situations. Considers such methods as ordinary differential equations, series solutions, complex variables, Laplace transforms, partial differential equations, and matrix operations. Emphasizes methods for formulating the problems. Assumes that students have studied some of these topics in appropriate mathematics courses. *Prereq. BS degree in chemical engineering, including mathematical analysis.*

CHE 3301 Chemical Engineering Mathematics 1 2 QH **Fall Quarter, As Announced**

CHE 3301 and CHE 3302 cover the same material with the same prerequisites as CHE 3300, but in two 2 QH courses.

CHE 3302 Chemical Engineering Mathematics 2 2 QH **Winter Quarter**

Continues CHE 3301. *Prereq. CHE 3301.*

CHE 3310 Chemical Engineering Thermodynamics 4 QH **Winter Quarter, Alternating Years**

Considers classical thermodynamics as a method of approach to the analysis of processes of interest to chemical engineers. Studies phase equilibria involving the various states of matter; prediction and correlation of physical, chemical, and transport properties of gases and liquids; and elementary concepts of quantum and statistical mechanics to interpret the empirical properties of classical thermodynamics. Reviews fundamental principles. *Prereq. BS degree in chemical engineering.*

CHE 3311 Chemical Engineering Thermodynamics 1 2 QH **Winter Quarter, As Announced**

CHE 3311 and CHE 3312 cover the same material with the same prerequisites as CHE 3310, but in two 2 QH courses.

CHE 3312 Chemical Engineering Thermodynamics 2 2 QH **Spring Quarter, As Announced**

Continues CHE 3311. *Prereq. CHE 3311.*

CHE 3320 Separation Processes 4 QH **Spring Quarter, Alternating Years**

Explores the calculation and design methods used in processes in-involving mass transfer. Topics include vapor liquid equilibria for binary and multicomponent systems, multicomponent distillation, absorption, and extraction. Emphasizes methods and techniques that are common to many separation processes. *Prereq. BS degree in chemical engineering.*

CHE 3321 Separation Processes 1 2 QH **Winter Quarter, As Announced**

CHE 3321 and CHE 3322 cover the same material with the same prerequisites as CHE 3320, but in two 2 QH courses.

CHE 3322 Separation Processes 2 2 QH **Spring Quarter, As Announced**

Continues CHE 3321. *Prereq. CHE 3321.*

CHE 3330 Chemical Process Control 4 QH **Fall Quarter, Alternating Years**

Reviews classical control techniques; state variable representation and analysis of continuous control systems in chemical engineering, including controllability, observability, and stability. Includes multivariable control problems in chemical engineering, an introduction to optimal control, and digital simulation when appropriate. *Prereq. Graduate standing in chemical engineering or permission of instructor.*

CHE 3331 Chemical Process Control 1 2 QH **Fall Quarter, As Announced**

CHE 3331 and CHE 3332 cover the same material with the same prerequisites as CHE 3330, but in two 2 QH courses.

CHE 3332 Chemical Process Control 2 2 QH **Winter Quarter**

Continues CHE 3331. *Prereq. CHE 3331.*

CHE 3340 Heterogeneous Catalysis 4 QH **Winter Quarter, Alternating Years**

Studies the experimental methods required for determining the surface area and pore structure of catalyst carriers. Explores the use of these structural characteristics to estimate mass and heat transport rates within porous catalyst in order to determine their effectiveness with respect to chemical reaction. Analyzes mechanisms for chemical poisoning of catalysts, and considers reactions of practical interest used to illustrate the applications of heterogeneous catalysis to modern chemical processing problems. *Prereq. BS degree in chemical engineering.*

CHE 3341 Heterogeneous Catalysis 1 2 QH **Winter Quarter, As Announced**

CHE 3341 and CHE 3342 cover the same material with the same prerequisites as CHE 3340, but in two 2 QH courses.

CHE 3342 Heterogeneous Catalysis 2 2 QH **Spring Quarter, As Announced**

Continues CHE 3341. *Prereq. CHE 3341.*

CHE 3350 Chemical Process Heat Transfer 4 QH **Spring Quarter, Alternating Years**

Presents empirical methods and calculations used to design heat transfer equipment for the chemical

process industries. Reviews basic heat transfer principles, and studies shell-and-tube calculations for liquid and/or vapor phase heat transfer, direct contact, and other special heat exchanger applications. *Prereq.* BS degree in chemical engineering.

CHE 3351 Chemical Process Heat Transfer 1 2 QH
Winter Quarter, As Announced

CHE 3351 and CHE 3352 cover the same material with the same prerequisites as CHE 3350, but in two 2 QH courses.

CHE 3352 Chemical Process Heat Transfer 2 2 QH
Spring Quarter, As Announced

Continues CHE 3351. *Prereq.* CHE 3351.

CHE 3400 Advanced Chemical Engineering Calculations 4 QH
As Announced

Offers the fundamental process principles leading to an understanding of the stoichiometric principles of chemical process plants. Studies complex material and energy balances with the view to applying these principles to actual large chemical plant conditions. *Prereq.* BS degree in chemical engineering, including differential equations.

CHE 3401 Advanced Chemical Engineering Calculations 1 2 QH
As Announced

CHE 3401 and CHE 3402 cover the same material with the same prerequisites as CHE 3400, but in two 2 QH courses.

CHE 3402 Advanced Chemical Engineering Calculations 2 2 QH
As Announced

Continues CHE 3401. *Prereq.* CHE 3401.

CHE 3410 Numerical Techniques in Chemical Engineering 4 QH
Fall Quarter, As Announced

Examines digital computer applications to chemical engineering problems. Topics include location of roots of linear and nonlinear equations, numerical integration, and curve-fitting techniques with emphasis on the numerical solution of ordinary and partial differential equations and on the subject of linear algebra. *Prereq.* BS degree in chemical engineering.

CHE 3411 Numerical Techniques in Chemical Engineering 1 2 QH
Fall Quarter, As Announced

CHE 3411 and CHE 3412 cover the same material with the same prerequisites as CHE 3410, but in two 2 QH courses.

CHE 3412 Numerical Techniques in Chemical Engineering 2 2 QH
Winter Quarter, As Announced

Continues CHE 3411. *Prereq.* CHE 3411.

CHE 3430 Chemical Data Estimation 4 QH
As Announced

Explores methods of obtaining physical and thermodynamic properties of chemical compounds and systems without resorting to laboratory investigation.

Introduces latest empirical relationships and physical and thermodynamics laws to obtain data for plant design and other chemical and engineering uses. *Prereq.* BS degree.

CHE 3431 Chemical Data Estimation 1 2 QH
Fall Quarter, As Announced

CHE 3431 and CHE 3432 cover the same material with the same prerequisites as CHE 3430, but in two 2 QH courses.

CHE 3432 Chemical Data Estimation 2 2 QH
Winter Quarter, As Announced

Continues CHE 3431. *Prereq.* CHE 3431.

CHE 3450 Analytical and Numerical Techniques 4 QH
As Announced

For students interested in solving comprehensive problems using computer methods. Problems solved in the course will be based on the interest of the students and staff and will be individual. *Prereq.* BS degree and knowledge of digital computer programming.

CHE 3500 Transport Phenomena 4 QH
Winter Quarter, As Announced

Presents and solves momentum rate conservation equations for steady-state fluid flow in two-dimensional boundary layers to obtain the fluid velocity profiles. Uses the solutions to consider heat and mass transfer phenomena at a fluid-solid interface. Applies the development of surface renewal theory to the description of heat and mass transfer phenomena. *Prereq.* BS degree in chemical engineering.

CHE 3501 Transport Phenomena 1 2 QH
Winter Quarter, As Announced

CHE 3501 and CHE 3502 cover the same material with the same prerequisites as CHE 3500, but in two 2 QH courses.

CHE 3502 Transport Phenomena 2 2 QH
Spring Quarter, As Announced

Continues CHE 3501. *Prereq.* CHE 3501.

CHE 3510 Modeling and Simulation of Chemical Processes 4 QH
Winter Quarter, Alternating Years

Explores the use of special purpose and general purpose computer programs in solving the steady-state material and energy balances of chemical processes. Discusses related background material that may be applied to these computer programs such as convergence acceleration for calculations involving recycle streams, tearing recycle streams for iteration on minimum number of streams and minimum number of parameters, and algorithms for design variable selection. *Prereq.* Graduate standing in chemical engineering.

CHE 3511 Modeling and Simulation of Chemical Processes 1 2 QH
Winter Quarter, As Announced

CHE 3511 and CHE 3512 cover the same material with the same prerequisites as CHE 3510, but in two 2 QH courses.

- CHE 3512 Modeling and Simulation of Chemical Processes 2** 2 QH
Spring Quarter, As Announced
 Continues CHE 3511. *Prereq. CHE 3511.*
- CHE 3520 Computer Process Control** 4 QH
Winter Quarter, Alternating Years
 Studies computer control hardware and software. Examines Z-transform, pulse transfer functions, and data holds. Topics include open- and closed-loop response and design of sampled-data systems, computer control algorithms, and digital simulation of sampled data systems. *Prereq. Graduate standing in chemical engineering.*
- CHE 3521 Computer Process Control 1** 2 QH
Winter Quarter, As Announced
 CHE 3521 and CHE 3522 cover the same material with the same prerequisites as CHE 3520, but in two 2 QH courses.
- CHE 3522 Computer Process Control 2** 2 QH
Spring Quarter, As Announced
 Continues CHE 3521. *Prereq. CHE 3521.*
- CHE 3530 Advanced Management Techniques in the Chemical Industry** 4 QH
Fall Quarter, Alternating Years
 Focuses on management techniques applied to the chemical industry. Pays special attention to management of research organizations and to management of engineering services, such as design, computer, and related activities. *Prereq. Graduate standing.*
- CHE 3531 Advanced Management Techniques in the Chemical Industry 1** 2 QH
Fall Quarter, As Announced
 CHE 3531 and CHE 3532 cover the same material with the same prerequisites as CHE 3530, but in two 2 QH courses.
- CHE 3532 Advanced Management Techniques in the Chemical Industry 2** 2 QH
Winter Quarter, As Announced
 Continues CHE 3531. *Prereq. CHE 3531.*
- CHE 3540 Advanced Process Design Concepts** 4 QH
Spring Quarter, Alternating Years
 Stresses techniques and approaches used in the development of new or improved processes. Topics include establishment of process bases, use of process simulators in design, optimization and evaluation of alternatives, and preliminary equipment design and cost estimating techniques. *Prereq. BS degree in chemical engineering.*
- CHE 3541 Advanced Process Design Concepts 1** 2 QH
Fall Quarter, As Announced
 CHE 3541 and CHE 3542 cover the same material with the same prerequisites as CHE 3540, but in two 2 QH courses.
- CHE 3542 Advanced Process Design Concepts 2** 2 QH
Winter Quarter, As Announced
 Continues CHE 3541. *Prereq. CHE 3541.*
- CHE 3543 Advanced Plant Design Concepts** 2 QH
Spring Quarter, As Announced
 Studies modern approaches to plant design: computer-oriented design, analysis and simulation of chemical processes, use of strategy decision making in design, advanced scheduling and planning techniques. *Prereq. BS degree in chemical engineering.*
- CHE 3560 Fluid Mechanics** 4 QH
Fall Quarter, Alternating Years
 Discusses statics, kinematics, and stress concepts associated with fluids. Considers formation of the general equations of motion with application to laminar and turbulent flow. Topics include boundary layer theory and compressible flow. *Prereq. BS degree in chemical engineering.*
- CHE 3561 Fluid Mechanics 1** 2 QH
Fall Quarter, As Announced
 CHE 3561 and CHE 3562 cover the same material with the same prerequisites as CHE 3560, but in two 2 QH courses.
- CHE 3562 Fluid Mechanics 2** 2 QH
Winter Quarter, As Announced
 Continues CHE 3561. *Prereq. CHE 3561.*
- CHE 3600 Polymer Science** 4 QH
Fall Quarter, Alternating Years
 Studies the basic concepts of polymers, thermodynamics of polymer solutions and measurement of molecular weight. Examines the physical and chemical testing of polymers. Investigates the crystallinity in polymers and rheology of polymers. Considers mechanisms and conditions for polymerization of polymers including step-reaction, addition, and copolymerization. Discusses carbon-chain polymers, fibers, and fiber technology. *Prereq. BS degree in chemical engineering or chemistry.*
- CHE 3601 Polymer Science 1** 2 QH
Fall Quarter, As Announced
 CHE 3601 and CHE 3602 cover the same material with the same prerequisites as CHE 3600, but in two 2 QH courses.
- CHE 3602 Polymer Science 2** 2 QH
Winter Quarter, As Announced
 Continues CHE 3601. *Prereq. CHE 3601.*
- CHE 3620 Principles of Polymerization** 4 QH
Fall Quarter, Alternating Years
 Introduces polymers and polymer properties, focusing on mechanisms of polymerization including step polymerization, radical-chain polymerization, emulsion polymerization, ionic-chain polymerization, chain copolymerization, and ring-opening polymerization. Examines the stereo chemistry of polymerization and synthetic reactions of polymers, and studies applications to reactor design of industrially important polymers. *Prereq. Graduate standing in chemical engineering.*

CHE 3621 Principles of Polymerization 1 2 QH
Fall Quarter, As Announced

CHE 3621 and CHE 3622 cover the same material with the same prerequisites as CHE 3620, but in two 2 QH courses.

CHE 3622 Principles of Polymerization 2 2 QH
Winter Quarter, As Announced

Continues CHE 3621. *Prereq.* CHE 3621.

CHE 3630 Chemical Processes of Pollution Control 4 QH
Spring Quarter, Alternating Years

Provides chemical engineering students with the fundamentals for handling environmental problems in the chemical process industries. Studies water quality requirements and industrial waste characteristics, wastewater treatment processes applicable to environmental engineering, and biological treatment processes and equipment. Discusses comprehensive design problems involving biological and tertiary treatment, and the economics of water treatment and reuse. *Prereq.* Graduate standing in chemical engineering.

CHE 3631 Chemical Processes of Pollution Control 1 2 QH
Winter Quarter, As Announced

CHE 3631 and CHE 3632 cover the same material with the same prerequisites as CHE 3630, but in two 2 QH courses.

CHE 3632 Chemical Processes of Pollution Control 2 2 QH
Spring Quarter, As Announced

Continues CHE 3631. *Prereq.* CHE 3631.

CHE 3659 Solar Energy Thermal Processes 2 QH
Fall Quarter

Covers fundamental thermal processes involved in obtaining useful heat from flat-plate solar collectors. Analyzes the components required in an active solar energy collection system and considers the economics of the system. *Prereq.* BS degree.

CHE 3663 Fundamentals of Polymer Processes 4 QH
Winter Quarter, Alternating Years

Presents the transport properties of polymer solutions and polymer melts. Discusses modeling and design of polymer processing equipment, as well as flow models for processes involving heat, mass, and/or momentum transfer. Topics include the analysis flow stability and elastic phenomena, and applications to the design of equipment for extrusion, calendaring, coating, fiber spinning, tular film blowing, injection molding, and mixing. *Prereq.* Graduate standing in chemical engineering.

CHE 3664 Fundamentals of Polymer Processing 1 2 QH
Winter Quarter, As Announced

CHE 3664 and CHE 3665 cover the same material with the same prerequisites as CHE 3663, but in two 2 QH courses.

CHE 3665 Fundamentals of Polymer Processing 2 2 QH
Spring Quarter, As Announced

Continues CHE 3664. *Prereq.* CHE 3664.

CHE 3670 Special Topics in Chemical Engineering 4 QH
As Announced

Topics of interest to the staff member conducting this class are presented for advanced study. A student may not take more than one special topics course with any one instructor. *Prereq.* Permission of department staff.

CHE 3671 Kinetics of Chemical Processes 4 QH
Spring Quarter, Alternating Years

Presents the theoretical foundations for the analysis of elementary chemical reaction rates, such as collision theory, particle dynamics, and transition state theory. Considers the theory of monomolecular reactions and the effect of solvent and electrostatic forces on liquid phase reaction rates. Covers homogeneous catalysis and selected free-energy correlations. *Prereq.* BS degree in chemical engineering.

CHE 3672 Kinetics of Chemical Processes 1 2 QH
Winter Quarter, As Announced

CHE 3672 and CHE 3673 cover the same material with the same prerequisites as CHE 3671, but in two 2 QH courses.

CHE 3673 Kinetics of Chemical Process 2 2 QH
Spring Quarter, As Announced

Continues CHE 3672. *Prereq.* CHE 3672.

CHE 3680 Corrosion Fundamentals 2 QH
As Announced

Studies economic factors, basic theories, types, behaviors of specific systems, and protection against corrosion. Wherever possible, engineering applications of the principles are emphasized. *Prereq.* BS degree.

CHE 3691 Seminar 2 QH
Any Quarter

Offers advanced topics presented by staff, outside speakers, and students in the graduate program. This course must be attended by all master's degree candidates. *Prereq.* Graduate standing in chemical engineering.

CHE 3701 Special Topics in Chemical Engineering 1 2 QH
Any Quarter

Offers advanced topics presented by a staff member. A student may take this course and its continuation in CHE 3702 with the same instructor.

CHE 3702 Special Topics in Chemical Engineering 2 2 QH
Any Quarter

Continues CHE 3701.

CHE 3796 Doctoral Thesis Continuation Any Quarter	0 QH	CHE 3861 Master's Thesis Any Quarter	4 QH
CHE 3798 Master's Thesis Continuation Any Quarter	0 QH	CHE 3862 Master's Thesis Any Quarter	2 QH
CHE 3799 Doctoral Thesis Continuation Any Quarter	0 QH	CHE 3880 Doctoral Thesis Any Quarter	0 QH
CHE 3860 Master's Thesis Any Quarter	10 QH	Theoretical and experimental work conducted under the supervision of the department. <i>Prereq.</i> Admission to doctoral program in chemical engineering.	
Analytical and/or experimental work conducted under the supervision of the department. Ten QH maximum credit for thesis. Students normally register in CHE 3861 or CHE 3862. <i>Prereq.</i> Graduate standing in chemical engineering.		CHE 3885 Doctoral Thesis Any Quarter	0 QH
		Theoretical and experimental work conducted under the supervision of the department. <i>Prereq.</i> Admission to program in chemical engineering.	

Civil Engineering

Each course description includes information on the quarter in which classes are usually offered. The quarters listed are presented for planning; however, the Graduate School of Engineering cannot guarantee that all courses will be offered. Students must refer to the Graduate School of Engineering Quarterly Course Offering sheets to determine what courses are actually offered in any given quarter.

CIV 3131 Engineering Statistics I Fall Quarter	2 QH	indeterminate structures. Examines statistical distributions of system parameters (for example, component strengths, flow rates, soil strengths) and demands (for example, seismic loading, traffic volumes). Topics include safety indices, load factors, reliability based design codes, and damage evaluation and reliability prediction of civil engineering facilities. <i>Prereq.</i> CIV 3131.	
Introduces the basic elements of probability theory and statistics and their use via the solution of various civil engineering problems encountered in fluid mechanics, construction management, structures, and transportation. Discusses the probability of events, random variables and distributions, derived distributions, expectation, and common probability models. <i>Prereq.</i> Undergraduate calculus.			
CIV 3132 Engineering Statistics 2 Winter Quarter	2 QH	CIV 3141 Numerical Methods in Civil Engineering 1 Fall Quarter	2 QH
Continues CIV 3131. Includes parameter estimation, confidence intervals, hypothesis testing, and linear statistical models. <i>Prereq.</i> CIV 3131.		Discusses errors in numerical analysis, solution of nonlinear algebraic equations by direct and iterative methods, and introduction to matrix eigenvalue problems. Examples are drawn from structural mechanics. <i>Prereq.</i> Admission to Graduate School of Engineering.	
CIV 3134 Decision Analysis in Civil Engineering Spring Quarter	2 QH	CIV 3142 Numerical Methods in Civil Engineering 2 Winter Quarter	2 QH
Studies the basic theory of decision-making under uncertainty, applied to design and managerial problems in civil engineering, feasibility analysis and construction (for example, reservoir capacity design, dam safety options, to build or not to build a drainage system, flood levee design, economic analysis of construction projects, value engineering, construction method selection in tunneling). Covers decision trees, value of perfect information, value of sample information, multi-criteria decision making, and multi-attribute utility theory. <i>Prereq.</i> CIV 3131.		Continues CIV 3141. Presents the approximation of functions: interpolation, least squares curve fitting, and orthogonal polynomials. Covers numerical differentiation and integration; solution of ordinary and partial differential equations, and integral equations; and discrete methods of solution of initial and boundary-value problems. Examples are drawn from structural mechanics, geotechnical engineering, hydrology, and hydraulics. <i>Prereq.</i> CIV 3141.	
CIV 3136 Performance and Safety Evaluation in Civil Engineering Spring Quarter	2 QH	CIV 3161 Systems Analysis I Fall Quarter	2 QH
Focuses on the application of reliability to the design and analysis of civil engineering facilities. Discusses the reliability of redundant systems such as		Applies linear and dynamic programming models to various civil engineering problems: the simplex method, sensitivity analysis, transportation problem, transshipment problems, shortest path problems,	

allocation problems, and inventory models. *Prereq. Admission to Graduate School of Engineering.*

CIV 3162 Systems Analysis 2 2 QH
Winter Quarter

Presents nonlinear optimization techniques, including integer programming, to civil engineering problems such as resource allocation, traffic equilibrium on congested networks, and facility location. *Prereq. CIV 3161.*

CIV 3171 Seminar in Public Works 1 2 QH
Winter Quarter

Discusses the history and role of public works in development, including historical development; economic and financial dimensions of public works in city and state government; technological change; and local, regional, and national planning. Considers public works capital development, including political, economic, financial, social, administrative, and technical factors. *Prereq. Admission to Graduate School of Engineering.*

CIV 3172 Seminar in Public Works 2 2 QH
Spring Quarter

Studies public works applications in management science, including such topics as applications of benefit/cost, cost-effectiveness, allocation models, decision theory, queuing theory, and simulation. Discusses maintenance management including inventory, performance standards, scheduling, budgets and finance. Examines the public works planning issues of environmental assessment, techniques of land use planning and procedures, facility location, and resource utilization. *Prereq. CIV 3171.*

CIV 3231 Construction Management 1 2 QH
Fall Quarter

Presents all aspects of construction cost estimating, including contracts, labor, equipment, material and indirect costs, conceptual estimating, detailed estimating and bid preparation, and computerized cost estimating. Students work on a cost estimating project as part of the requirements. *Prereq. Admission to Graduate School of Engineering.*

CIV 3232 Construction Management 2 2 QH
Winter Quarter

Considers construction planning and scheduling with an emphasis on network-based scheduling systems such as CPM and Precedence diagramming, resource leveling and allocation, time-cost trade off, PERT statistical approach, and introduction to network-based project control. *Prereq. Admission to Graduate School of Engineering.*

CIV 3237 Construction Methods and Equipment 1 2 QH
Fall Quarter

Discusses the selection and application of construction equipment; earthmoving equipment including excavators, bulldozers, and scrapers; productivity analysis of equipment operations; and construction equipment economics. *Prereq. Admission to Graduate School of Engineering.*

CIV 3238 Construction Methods and Equipment 2 2 QH
Winter Quarter

Continues CIV 3237, treating equipment production systems including truck-loader, scraper-tractor, and belt-conveyer systems; bituminous pavements material and equipment; and asphalt plants. *Prereq. CIV 3237.*

CIV 3241 Legal Aspects of Civil Engineering 1 2 QH
Fall Quarter

Presents United States and international legal systems and theories necessary for the comprehension of business and contractual liabilities, rights, and obligations in the engineering field. *Prereq. Admission to Graduate School of Engineering.*

CIV 3242 Legal Aspects of Civil Engineering 2 2 QH
Winter Quarter

Offers a description and evaluation of various types of construction contracts, procedures and formats for submitting bids, filing claims, and legal steps to avoid liabilities, utilizing the principles learned in CIV 3241. *Prereq. CIV 3241.*

CIV 3245 Construction Seminar 2 2 QH
Spring Quarter

Focuses on reading and discussing recent research publications in construction engineering. *Prereq. Limited to Construction Management Program majors.*

CIV 3250 Project Evaluation and Financing 2 2 QH
Fall Quarter

Reviews project evaluation techniques, as applied to construction and infrastructure projects. Studies bond pricing mortgage analysis, construction loan analysis in the development process, and valuation of income-producing properties. Considers project financing packages in the areas of real property and infrastructure. Examines the impact of financing on project value, and Capital Budgeting Models and their applications to infrastructure planning. *Prereq. Concurrent with ACC 3811.*

CIV 3252 Construction Project Control and Organization 2 2 QH
Winter Quarter

Discusses the organization of construction firms, both at the general corporate level and at the project level. Considers organization dynamics designed to respond to the requirements of the environment given the internal constraints of the firm. Introduces computer systems for the control of construction projects, emphasizing design attributes to fit the needs of the organization and the end users. Explores the estimating, scheduling, budgeting, and financial control of projects. Topics include network-based systems for planning and time control, intra-project and inter-project resource allocation, and database design concepts for decision support systems. *Prereq. CIV 3161.*

CIV 3310 Environmental Chemistry 1 2 QH
Fall Quarter

Reviews basic chemistry and discusses the chemical kinetics and equilibrium chemistry of homogeneous

and heterogeneous systems with applications in environmental engineering. Studies the physical and chemical properties of water, acid-base reactions, pH, alkalinity, equilibrium calculation using analytical and graphical methods, and coordination chemistry. Emphasizes the quantitative evaluation of chemical changes in the environment. *Prereq.* Two quarters of general chemistry.

CIV 3311 Environmental Chemistry 2 2 QH

Winter Quarter

Continues CIV 3310, including the basic principles of chemical thermodynamics, reprecipitation-dissolution reactions, adsorption-desorption, colloid chemistry, redox reactions, and organic chemistry as they relate to environmental problems and engineering. Discusses practical applications in water softening, coagulation, activated-carbon adsorption, and chlorination, as well as electrochemical measurements. *Prereq.* CIV 3310; to be taken concurrently with CIV 3325.

CIV 3312 Environmental Chemistry 1, 2 4 QH

Fall Quarter

Embodies the material in CIV 3310 and CIV 3311.

Prereq. Two quarters of general chemistry.

CIV 3315 Water and Wastewater Treatment 1 2 QH

Fall Quarter

Examines design principles and theory for pretreatment, sedimentation, coagulation, flocculation, chemical softening, filtration, activated carbon absorption, and disinfection. *Prereq.* Undergraduate fluid mechanics courses.

CIV 3316 Water and Wastewater Treatment 2 2 QH

Winter Quarter

Continues CIV 3315, including design principles involved in various biological treatment systems, oxygen transfer systems, solids thickening, aerobic digestion, and anaerobic treatment systems. *Prereq.* CIV 3315 and CIV 3323.

CIV 3317 Advanced Wastewater Treatment 3 2 QH

Spring Quarter

Explores operational and design principles involved in sludge dewatering, biological nitrification and denitrification, phosphorus removal, and other advanced treatment methods. *Prereq.* CIV 3316.

CIV 3318 Water and Wastewater Treatment 1 and 2 4 QH

Fall Quarter

Embodies the material in CIV 3315 and CIV 3316.

Prereq. Undergraduate fluid mechanics courses.

CIV 3321 Environmental Biological Processes 4 QH

Winter Quarter

Embodies the material in CIV 3322 and CIV 3323.

Prereq. CIV 3311.

CIV 3322 Environmental Biological Processes 1 2 QH

Winter Quarter

Discusses microbiology with emphasis on biological processes of importance in environmental engineering applications. Topics include cell structure, cell nutrition, morphology, microbial metabolism, and kinetics as applied to biological treatment processes.

Prereq. CIV 3310. May be taken concurrently with CIV 3311.

CIV 3323 Environmental Biological Processes 2 2 QH

Spring Quarter

Continues CIV 3322. Topics include biological waste-water treatment processes, eutrophication theory, disinfection theory, and the effects of toxins on microorganisms. *Prereq.* CIV 3322.

CIV 3325 Environmental Chemistry Laboratory 2 QH

Winter Quarter

Emphasizes analysis related to important topic areas in environmental chemistry. Topics include alkalinity, hardness, acid-base reactions, chemical kinetics, precipitation reactions, and chlorine and oxidation-reduction reactions. *Prereq.* CIV 3310. May be taken concurrently with CIV 3311.

CIV 3326 Biological Processes Laboratory 2 QH

Spring Quarter

Focuses on analysis related to microbiological examination and other wastewater treatment parameters used to monitor the biological process such as BOD, TOC, COD, gravimetric methods, and dissolved oxygen. *Prereq.* CIV 3325.

CIV 3327 Environmental Laboratory 4 QH

Fall Quarter

Embodies the material in CIV 3325 and CIV 3326.

Prereq. Taken concurrently with CIV 3312.

CIV 3331 Environmental Computer Applications 1 2 QH

Fall and Winter Quarters

Employs computers to handle environmental engineering data. Topics include statistics, curve fitting, correlation, linear regression, spreadsheet data handling, BOD kinetics, and chemical reaction interactions. *Prereq.* Admission to Graduate School of Engineering and familiarity with FORTRAN or BASIC.

CIV 3332 Environmental Computer Applications 2 2 QH

Spring Quarter

Continues CIV 3331. Studies the application of computer modeling and database management systems to specific environmental problems and processes including reactor kinetics, stream and lake modeling, treatment plant performance modeling, and stormwater management. *Prereq.* CIV 3331.

CIV 3341 Industrial Waste Disposal 2 QH

Spring Quarter

Evaluates industrial waste problems and development of process design for the required treatment facilities, and studies various manufacturing processes and their wastewater problems. Examines industrial waste survey techniques, characteristics of industrial wastes, evaluation of hazardous materials, and waste reduction methods. Considers the physical, chemical, biological, and advanced treatment methods, as well as industrial wastewaters and disposal and treatment of industrial solids and liquids. *Prereq.* CIV 3311 and CIV 3317 may be taken concurrently.

- CIV 3343 Process Laboratory in Environmental Engineering 1** 2 QH
Winter Quarter
 Laboratory scale unit operations illustrate the physical, chemical, and biological principles involved in water and wastewater treatment. The aim is to obtain criteria for system design. Topics include disinfection, water softening, sedimentation, chemical coagulation, and ion exchange. *Prereq.* CIV 3316 and CIV 3326 or CIV 3318 concurrently.
- CIV 3344 Process Laboratory in Environmental Engineering 2** 2 QH
Spring Quarter
 Continues CIV 3343. Topics include biodegradability studies using activated sludge, fixed-film reactors, anaerobic digestion, vacuum filtration, and chemical-physical processes involved in waste-water treatment. A comprehensive evaluation of each unit process is required in a report from each student. *Prereq.* CIV 3343.
- CIV 3348 Stream Sanitation** 2 QH
Winter Quarter
 Analyzes the fate and effects of discharge of conservative and nonconservative pollutants in surface receiving waters and groundwaters. Topics include BOD and oxygen and relationships in streams, eutrophication, and general water quality improvement techniques. *Prereq.* CIV 3310.
- CIV 3352 Open Channel Flow** 2 QH
Fall Quarter
 Studies gradually varied flow, hydraulic jump and its applications; channel design flow through nonprismatic channel sections; flow in channels of nonlinear alignment; and flood routing in rivers. *Prereq.* Undergraduate fluid mechanics and hydraulic engineering.
- CIV 3355 Hydrology 1** 2 QH
Winter Quarter, Alternate Years
 Discusses the elements of the hydrologic cycle, precipitation, evaporation, streamflow, and groundwater. Considers water balance equation for watersheds, streamflow hydrographs, unit hydrographs, and hydrographs of overland flow. Covers the relation between precipitation and runoff, hydrologic and hydraulic routings, and linear reservoirs routing. *Prereq.* Undergraduate fluid mechanics and hydraulic engineering.
- CIV 3356 Hydrology 2** 2 QH
Spring Quarter, Alternate Years
 Investigates deterministic hydrologic models, probability in hydrology, and stochastic hydrology, generation of data, and Markov chain series. Topics include flood forecasting, applications of hydrology, and design considerations. *Prereq.* CIV 3355.
- CIV 3358 Flow Through Porous Media** 2 QH
Fall Quarter
 Examines hydrogeology and groundwater uses and properties of porous media. Focuses on Darcy's law, hydraulic conductivity, and anisotropic and heterogeneous media. Considers potential theory; flow nets and seepage; Dupuit-Forcheimer assumptions; confined and unconfined aquifers; hydraulics of wells; steady and transient flow equations; confined and unconfined flows; pumping tests; superposition; and methods of image. *Prereq.* Undergraduate fluid mechanics and hydraulic engineering.
- CIV 3360 Groundwater and Seepage** 2 QH
Winter Quarter, Alternate Years
 Studies laboratory and field measurements of hydraulic conductivity including mechanisms of contaminant transport in groundwater, reactive and unreactive media, isotherms, and distribution coefficient. Topics include flow models; finite difference technique; finite element techniques; numerical modelling of contaminant transport; double liner systems for landfill; mitigation mechanisms of compacted clay liners; and waste disposal alternatives. *Prereq.* CIV 3358.
- CIV 3367 Water Resources Planning** 2 QH
Fall Quarter, Alternate Years
 Examines the nature of water resources projects (sociopolitical, legal), the objectives of water resources planning (economic, cost, benefit), and problems in water resources engineering. Introduces linear and dynamic programming, simulation methods, and deterministic and stochastic modeling. *Prereq.* CIV 3355.
- CIV 3370 Air Pollution Engineering** 2 QH
Winter Quarter
 Investigates the theory and practice related to engineering management of air resources. Studies applications of models for the atmospheric dispersion of pollutants, and analyzes control systems for gaseous and particulate emissions utilizing dry collection, wet collection, absorption, and catalytic processes. Discusses source control evaluation and air quality standards. Course CIV 3374 is recommended. *Prereq.* Admission to Graduate School of Engineering.
- CIV 3372 Air Sampling and Analysis** 2 QH
Spring Quarter, Alternate Years
 Discusses the basic design considerations and requirements for air quality surveillance. Examines the methodologies for air quality sampling; sampling frequencies; measurement techniques; and data acquisition, handling, and analysis. Discusses manual and automated techniques for evaluating source and ambient systems. Employs statistical techniques to evaluate air quality management strategies. *Prereq.* CIV 3370.
- CIV 3374 Air Pollution Science** 2 QH
Fall Quarter
 Explores the biological and chemical aspects of air pollution, emphasizing the toxicological aspects of the environment, physiological effects of aerosols, analysis of organic and inorganic constituents of the atmosphere, and rationale for establishment of air quality criteria and standards. Open to nonengineering as well as to engineering graduate students. *Prereq.* Permission of department and instructor.

- CIV 3376 Industrial Hygiene** 2 QH
Winter Quarter
 Studies the characterization and control of industrial problems associated with noise, heat, and ventilation. Discusses the physical and biological aspects of environmental stress. Emphasizes the application of engineering principles to the design of control systems. Reviews evaluation procedures for control effectiveness. *Prereq. Admission to Graduate School of Engineering.*
- CIV 3378 Environmental Planning and Management** 2 QH
Fall Quarter
 Examines the planning, operation, and management of specific environmental systems, such as collection systems. Topics include solids separators, combined systems control, sewer flushing, deposition loadings with least-squared applications, and case studies in optimal design of treatment plants with variable input. *Prereq. Admission to Graduate School of Engineering.*
- CIV 3380 Environmental Protection** 2 QH
Spring Quarter
 Considers environmental quality and its effects on health, comfort, aesthetics, balance of ecosystems, and renewable resources. Discusses the interaction of the water-land-air complex, vector control, food protection, ionizing radiation, other radiation, and the energies of heat and sound. *Prereq. Admission to Graduate School of Engineering.*
- CIV 3384 Solid Waste Management** 2 QH
Fall Quarter
 Presents basic solid waste management for engineering and science students covering storage, collection practices, sanitary landfill principles, incineration practices, and reclamation possibilities. *Prereq. Admission to Graduate School of Engineering.*
- CIV 3386 Hazardous Waste Practices** 2 QH
Spring Quarter
 Investigates hazardous waste management practices, including identification, storage, transport, treatment processes, incineration, recycling, reuse, chemical landfills, and groundwater contamination. *Prereq. CIV 3311 or 3312.*
- CIV 3410 Soil Mechanics 1** 2 QH
Fall Quarter
 Studies phase relationships and index properties, permeability, capillarity, effective stress concept, porous media flow, stress distribution, stress path concept, and 1-D settlement analysis. *Prereq. Undergraduate course in soil mechanics.*
- CIV 3411 Soil Mechanics 2** 2 QH
Winter Quarter
 Continues CIV 3410. Examines consolidation theory, 3-D settlement analysis, shear strength properties of soils, and stress path analysis. *Prereq. CIV 3410.*
- CIV 3412 Stability and Seepage** 2 QH
Spring Quarter
 Continues CIV 3411. Reviews stability of open cuts and natural slopes, numerical analysis and computer

applications to stability, seepage, consolidation, and deformation problems. Presents lab testing, field instrumentation, and special topics. *Prereq. CIV 3411 or CIV 3413.*

CIV 3413 Soil Mechanics 1, 2 4 QH
Fall Quarter

Embodies the material in CIV 3410 and CIV 3411. *Prereq. Undergraduate course in soil mechanics.*

CIV 3420 Foundation Engineering 1 2 QH
Fall Quarter, Alternate Years

Studies lateral earth pressure theory, retaining wall design, anchored bulkheads, braced cofferdams, dewatering, and observational approach to design. *Prereq. CIV 3411 or CIV 3413.*

CIV 3421 Foundation Engineering 2 2 QH
Winter Quarter, Alternate Years

Presents bearing capacity, design of shallow foundations, site improvement (preloading, deep densification), and case studies of foundation performance. *Prereq. CIV 3420.*

CIV 3422 Foundation Engineering 3 2 QH
Spring Quarter, Alternate Years

Surveys pile foundations, caissons, selection of foundation scheme, and case studies. *Prereq. CIV 3421.*

CIV 3440 Experimental Soil Mechanics 4 QH
Spring Quarter, Alternate Years

Offers laboratory evaluation of engineering properties of soils with emphasis on permeability, compressibility, and strength. Introduces model analysis of static and dynamic behavior of soils. *Prereq. CIV 3411 or CIV 3413.*

CIV 3450 Engineering Geology 2 QH
Winter Quarter

Presents selected topics in historical and structural geology related to engineering geology. Considers origin and occurrence of various rock types, geologic structures, and faulting and joint systems. Examines weathering of rock and weathering products, glaciation, geologic mapping, and environmental aspects. Includes case studies. *Prereq. Undergraduate course in geology.*

CIV 3470 Introduction to Dynamics and Earthquake Engineering 2 QH
Fall Quarter

Introduces dynamic response analysis of one-degree-of-freedom systems, characteristics of earthquakes and resulting ground motions, response spectra, and the stress-strain behavior of soils during dynamic and repeated loading. Includes lab and field determinations, wave propagation through elastic media, and the effect of local soil condition upon earthquake ground motions.

CIV 3471 Soil Dynamics 2 QH
Winter Quarter, Alternate Years

Presents dynamic response analysis of a single mass, multidegree-of-freedom systems. Considers machine foundation design and analysis, soil-structure interaction, ground vibrations, sources, and control. Topics include shear strength during repeated loading,

liquefaction; and dynamic analysis of retaining structures and slopes. *Prereq.* CIV 3470.

CIV 3480 Seismic Design 2 QH
Spring Quarter, Alternate Years

Surveys earthquake considerations in building design process and dynamic analysis of multidegree-of-freedom elastic systems subjected to earthquake motions and cyclically applied forces. Discusses inelastic dynamic response analysis, seismic provisions of building codes, and soil-structure interaction. *Prereq.* CIV 3470 and CIV 3546.

CIV 3485 Earthquake Engineering 2 QH
Spring Quarter, Alternate Years

Examines seismic hazard and seismic risk analysis, seismic design decision analysis, lifeline earthquake engineering, pipelines, liquid storage tanks, and water distribution systems. Topics include earthquake analysis of earth dams and slopes, dynamic analysis of retaining walls and offshore facilities, and dynamically loaded piles. *Prereq.* CIV 3470.

CIV 3510 Advanced Structural Mechanics I 2 QH
Fall Quarter

Analyzes force equilibrium (stress), deformation/displacement (strain), and force/deformation (Hooke's Law) for an elastic solid. Studies compatibility, governing equations for complete and approximate elasticity solution, and plane stress solution for narrow rectangular beams. Considers torsion, Saint Venant's theory, membrane analogy, rectangular sections, and thin open and closed sections. Introduces bending of thin plates. *Prereq.* Undergraduate structural mechanics and structural analysis.

CIV 3511 Advanced Structural Mechanics 2 2 QH
Winter Quarter

Examines consistent models for the mechanics of simple structural elements: axial, bending, plane stress, and the like. Studies equilibrium, geometry of deformation, and force/deformation as the governing relations of all structural elements. Presents work and energy principles: virtual displacement, virtual forces, minimum potential energy, and minimum complementary energy. Introduces variational ideas and explores Rayleigh-Ritz method. *Prereq.* CIV 3510.

CIV 3520 Concrete Materials: Science and Technology 2 QH
Winter Quarter

Covers chemical, physical, and micro-structural properties of hydrated cement. Discusses strength-porosity relationship, the concept of gel/space ratio, transition zone (cement paste-aggregate interface), mix design and procedures, admixtures, and pozzolans. Explores micro-cracking and the stress-strain curve, fracture and failure criteria, and dimensional stability. Topics include creep and shrinkage, durability and permeability, freezing and thawing, sulfate attack, alkali-aggregate reaction, corrosion of reinforcement, surface wear, and deterioration control and prevention. Considers concretes for special applications: high-strength, shrinkage-compensating, fibre

reinforced, and testing. *Prereq.* Admission to Graduate School of Engineering.

CIV 3521 Fracture and Fatigue 2 QH
Spring Quarter, Alternate Years

Examines fracture and fatigue of materials and structures, emphasizing steel and concrete. Studies stress intensity factor, fracture toughness, mixed-mode fracture, linear-elastic versus nonlinear fracture-mechanics, fatigue-crack, initiation and propagation, stress corrosion cracking, corrosion fatigue, fracture criteria, and applications infinite element analysis. *Prereq.* Admission to Graduate School of Engineering.

CIV 3522 Nondestructive Evaluation 2 QH
Spring Quarter, Alternate Years

Explores nondestructive testing (NDT) of structures and materials emphasizing concrete and steel. Introduces theory, current technology, and practice, including ultrasonic pulse velocity, pulse echo, acoustic emission, radioactive/nuclear, radiography, surface hardness, penetration resistance, pullout, maturity, and others. Compares advantages and disadvantages of various methods as to accuracy/variability, safety, and cost effectiveness. *Prereq.* Admission to Graduate School of Engineering.

CIV 3525 Stability 2 QH
Spring Quarter

Discusses the prediction of the buckling loads in columns, behavior of beam columns, use of numerical methods to compute the buckling loads of nonprismatic members, and buckling of plates. *Prereq.* CIV 3510 and CIV 3511.

CIV 3530 Finite-Element Analysis of Structures 2 QH
Spring Quarter

Introduces finite-element method for structural analysis. Reviews the direct stiffness method, focusing on formulation of element stiffness matrices by direct use of elasticity relations and by energy methods for simple elements. Topics include axial, bending, plane stress, and plane strain; transformation of coordinate systems; lumping work equivalent loads; bounds on the error solution; plate bending; and use of finite-element computer programs. *Prereq.* CIV 3511.

CIV 3536 Structural Analysis 2 QH
Winter Quarter

Studies the formulation and solution of structural problems with primary application to member systems (trusses, frames, curved members), matrix formulation of flexibility and stiffness methods, and geometrically nonlinear behavior. *Prereq.* Admission to the Graduate School of Engineering.

CIV 3546 Structural Dynamics 2 QH
Winter Quarter, Alternate Years

Examines matrix formulation of the dynamic equations of equilibrium, generation of mass, stiffness and damping matrices, static condensation, modal analysis of linear response, and the response spectrum method in modal analysis. Discusses numerical integration techniques for nonlinear

analysis of multidegree-of-freedom systems. *Prereq.* CIV 3470 and CIV 3536.

CIV 3559 Behavior of Reinforced Concrete Structures 2 QH
Fall Quarter

Covers moment-curvature relationships for reinforced concrete cross-sections and the effect of design parameters on resulting behavior, ductility, and effective stiffness. *Prereq.* Admission to Graduate School of Engineering.

CIV 3560 Prestressed Concrete 2 QH
Fall Quarter

Introduces the fundamentals of prestressing, including the design of prestressed concrete beams for flexure and shear and design of end blocks. Covers the load balancing method for the analysis of indeterminate prestressed structures, and surveys column design. *Prereq.* Undergraduate reinforced concrete design and structural analysis.

CIV 3561 Reinforced Concrete Slabs 2 QH
Spring Quarter

Studies the design of two-way slabs by the equivalent frame method, yield line theory, and prestressing of slabs. Considers the strip method, and introduces folded plate design. *Prereq.* Undergraduate reinforced concrete design and structural analysis.

CIV 3570 Steel Design 2 QH
Fall Quarter

Offers advanced topics in elastic design in structural steel. Considers design problems involving braced and rigid frame structures subject to gravity, wind, and seismic loads. *Prereq.* Undergraduate steel design and structural analysis.

CIV 3571 Inelastic Steel Design 2 QH
Winter Quarter

Presents advanced topics in analysis and design in structural steel, emphasizing plastic behavior including rigid frame buildings and braced multistory frame buildings. *Prereq.* Undergraduate steel design and structural analysis.

CIV 3575 Bridge Design 2 QH
Spring Quarter, Alternate Years

Studies the behavior of different types of bridge decks and the design of typical cases using current AASHTO specifications. Examines the development of mathematical models for analyzing special cases. Topics include curved bridge design and skewed decks. *Prereq.* Graduate standing and undergraduate background in steel and concrete design.

CIV 3610 Urban Public Transportation 2 QH
Spring Quarter, Alternate Years

Considers the analysis and planning of public transportation systems, including bus, subway, commuter rail, and paratransit. Discusses performance models; service evaluation and monitoring; data collection; service design; demand prediction; and institutional and economic issues. *Prereq.* Admission to Graduate School of Engineering.

CIV 3630 Traffic Engineering 2 QH
Spring Quarter

Focuses on the measurement of traffic characteristics. Explores the theory of traffic flow and analytical techniques, highway capacity, performance evaluation, and intersection design including geometric and signalization options. Introduces computer methods. *Prereq.* CIV 3131.

CIV 3635 Transportation Engineering 2 QH
Winter Quarter, Alternate Years

Describes and evaluates different modes of transportation, both existing and proposed, and their performance and cost characteristics. Discusses design, performance, and selection criteria for vehicles and roadbeds. *Prereq.* Admission to Graduate School of Engineering.

CIV 3640 Theory and Practice of Transportation Planning 1 2 QH
Fall Quarter

Reviews the establishment of goals, objectives, and criteria. Addresses the current planning framework, and examines basic demand and supply analysis methods and transportation systems management. Introduces environmental and economic evaluation. *Prereq.* Admission to Graduate School of Engineering.

CIV 3641 Theory and Practice of Transportation Planning 2 2 QH
Fall Quarter

Continues CIV 3640. Studies transportation demand modeling from regional economic analysis to traffic and public transportation network assignment. Discusses technical and economic evaluation, and examines current issues, including environmental assessment. *Prereq.* CIV 3640, taken previously or concurrently.

CIV 3650 Urban Transportation Analysis 1 2 QH
Winter Quarter, Alternate Years

Presents travel demand models, including distribution, mode split, elasticity, and direct demand models. Covers economic and performance evaluation under variable demand. *Prereq.* CIV 3141.

CIV 3651 Urban Transportation Analysis 2 2 QH
Spring Quarter, Alternate Years

Continues CIV 3650. Covers deterministic and probabilistic performance models for a variety of transportation modes, with an emphasis on highways. Studies design models for traffic control and network equilibrium models. *Prereq.* CIV 3161, CIV 3162, and CIV 3131.

CIV 3798 Master's Continuation 0 QH
Any Quarter

CIV 3799 Doctoral Continuation 0 QH
Any Quarter

CIV 3830 Special Topic in Civil Engineering 2 QH
Fall, Winter, and Spring Quarters

Offers advanced topics selected and presented by a staff member. This course is initiated by the

appropriate discipline committee and approved by the department. *Prereq.* *Permission of instructor.*

CIV 3835 Special Project in Civil Engineering 2 QH
Any Quarter

An individual effort in an area selected by student and adviser and approved by the departmental discipline committee resulting in a definitive report. *Prereq.* *Permission of department.*

CIV 3850 Master's Report 4 QH
Any Quarter

An individual effort consisting of laboratory and/or literature investigation and analysis or advanced design of a project in an area of civil engineering selected by student and adviser resulting in a definitive report. The report must be completed seven years from the start of the master's program. *Prereq.* *Permission of department.*

CIV 3851 Master's Report 2 QH
Any Quarter

CIV 3860 Master's Thesis 8 QH
Any Quarter

Analytical and/or experimental research conducted by arrangement with and under the supervision of the department. *Prereq.* *Permission of department.*

CIV 3861 Master's Thesis 4 QH
Any Quarter

CIV 3862 Master's Thesis 2 QH
Any Quarter

CIV 3880 Doctoral Thesis 0 QH
Any Quarter

Open to full-time doctoral students only. *Prereq.* *Admission to doctoral program in civil engineering.*

Electrical and Computer Engineering

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ECE 3100 Introduction to Circuits and Systems 4 QH
Fall Quarter

Introduces the circuit elements (R, L, and C) and explores Kirchoff's laws, Tellegen, Thevenin's theorem, Mesh and nodal analysis. Examines the development of system function approach, Laplace and Fourier transform theory applied to circuit analysis. Other topics include sinusoidal steady-state, n-port network theory, and power and energy concepts. *Prereq.* *Admission to graduate school.*

ECE 3101 Introduction to Electronics 4 QH
Winter Quarter

Discusses the characteristics of the theoretical physical junction, including the Ebers-Moll model for bipolar junction transistors, characteristics of bipolar and field-effect devices, basic digital inverters and logic gates, and various logic families. Studies the use of transistors in the design of analog circuits. Other topics include biasing, linearized incremental models, load lines, signal flowgraphs, frequency response and gain calculation for single and cascaded stages. *Prereq.* *ECE 3100 or equiv.*

ECE 3102 Introduction to Electromagnetic Field Theory 4 QH
Spring Quarter

Covers the definition of scalar and vector fields; vector calculus; concepts of gradient, divergence, curl, and the "del" operator; and free-space electrostatics. Explores the generalization of the Maxwell equations to the case of time-varying fields; Faraday induction law, wave equations, and the plane wave solution. *Prereq.* *ECE 3100 or equiv.*

ECE 3103 Introduction to Digital Computers 4 QH
Fall Quarter

Introduces the basic components of digital systems and methods for their analysis and design, including combinational and sequential circuits, integrated circuit logic families and functional building blocks, registers, counters, decoders, multiplexers, and memories. Examines data representation and coding techniques. Covers central processor alternatives: instruction formats, addressing modes, bus structures, arithmetic units, timing analysis, and stacks. Surveys algorithms for arithmetic operations with various data representations. *Prereq.* *Admission to graduate school.*

ECE 3104 Introduction to Communications 4 QH
Spring Quarter

Reviews system theory, convolution, Fourier series, Fourier integral, signal analysis, Fourier methods, correlation functions. Discusses density functions, power spectra, amplitude modulation, frequency modulation, phase modulation, sampling theory and digital modulation techniques. *Prereq.* *ECE 3108 or equiv.*

ECE 3105 Introduction to System Software 1 2 QH
Fall Quarter

Presents programming style considerations, software testing, and software reliability. Demonstrates data structures, including stacks, queues, linked lists, trees, and graphs. Emphasizes the use of Pascal to implement typical system software routines that use the above data structures. Topics include modern system software considerations for multiprocessor, array processor, and graphic processor systems. A

knowledge of Pascal is helpful but not required for this course. *Prereq.* Admission to graduate school.

ECE 3106 Introduction to System Software 2 **2 QH**
Winter Quarter

Analyzes absolute and relocatable program translators. Topics include assemblers, disassemblers, macroassemblers, linkers, an overview of compilers, interpreters, simulators and emulators. Lab assignment may include design and implementation of an absolute assembler for a very simplified instruction set. *Prereq.* ECE 3105.

ECE 3107 Introduction to System Software 3 **2 QH**
Spring Quarter

Analyzes operating system structure and concepts including memory management, fragmentation, paging, virtual memory, job and process scheduling, I/O management, and file management. Covers operating system concepts for multiuser systems: critical variables, race conditions, Dekker's algorithm, some sample multiuser routines. Lab assignment may include writing simulated paged memory management and process scheduling routines. *Prereq.* ECE 3106.

ECE 3108 Introduction to Signals and Systems **4 QH**
Winter Quarter

Describes and analyzes continuous and discrete time signals and systems. Topics include time domain analysis of linear and time-invariant (LTI) systems, frequency domain analysis of signals and LTI systems, Laplace and z-transforms, and state space descriptions of continuous and discrete time systems. *Prereq.* ECE 3100 or equiv.

ECE 3120 Power Circuit Analysis 1 **2 QH**
Fall Quarter

Introduces fundamental concepts of single-phase and polyphase power systems: definitions of terms, use of per unit quantities, equivalent circuits of symmetrical 3-phase systems. Introduces symmetrical components, short circuits on systems with a single power source. *Prereq.* BSEE or ECE 3100 and ECE 3102.

ECE 3130 Electrical Machinery Theory 1 **2 QH**
Fall Quarter

Reviews magnetic circuit concepts and electromechanical energy-conversion principles. Discusses steady-state analysis of transformers, synchronous machines, and induction machines. *Prereq.* BSEE or ECE 3100 and ECE 3102.

ECE 3200 Mathematical Methods in Computer Science **2 QH**
Fall Quarter

Studies algebraic concepts relevant to computer science: sets, relations, mapping, orderings, algebraic systems, Boolean algebras, groups, rings, finite fields. Introduces vector spaces and linear algebras over finite fields. *Prereq.* Admission to graduate school.

ECE 3211 Mathematical Methods in Electrical Engineering 1 **4 QH**
Fall and Winter Quarters

Surveys fundamental algebraic concepts: sets, functions, relations, operations. Presents algebraic

structures: group, rings, fields, homomorphisms, polynomials. Studies vector spaces and linear operators: representations, matrices and linear algebraic equations, orthogonality, equivalence and similarity transformations, eigenvalues and eigenvectors, canonical forms, functions of a square matrix, quadratic forms and congruence transformations, orthogonal transformations. Introduces polynomial matrices and applications to communications and control theory. *Prereq.* Admission to graduate school.

ECE 3212 Mathematical Methods in Electrical Engineering 1-A **2 QH**

Fall and Winter Quarters

ECE 3212 and ECE 3213 cover the same material with the same prerequisites as ECE 3211, but in two 2 QH courses.

ECE 3213 Mathematical Methods in Electrical Engineering 1-B **2 QH**

Winter and Spring Quarters

Continues ECE 3212. *Prereq.* ECE 3212.

ECE 3221 Linear Systems Analysis **4 QH**
Winter and Spring Quarters

Introduces the state variable theory of continuous and discrete linear systems. Topics include standard canonical representations, the concept of state and the representation of interconnected systems, linear spaces, the state equations and their solution, and stability. Introduces the general control problem in terms of controllability and observability. *Prereq.* ECE 3211, ECE 3108, or equiv.

ECE 3222 Linear Systems Analysis A **2 QH**
Fall and Winter Quarters

ECE 3222 and ECE 3223 cover the same material with the same prerequisites as ECE 3221, but in two 2 QH courses.

ECE 3223 Linear Systems Analysis B **2 QH**
Winter and Spring Quarters

Continues ECE 3222. *Prereq.* ECE 3222.

ECE 3231 Mathematical Methods in Electrical Engineering 2 **4 QH**
Fall Quarter

Covers complex variable theory, analytic functions, and Cauchy-Riemann equations. Investigates complex integration and Cauchy integral formula, Taylor and Laurent Series, the residue theorem, conformal mapping. Other topics include Laplace transform and its applications, problems in partial differential equations, generalized Fourier series and Green's functions, general integral transforms, Sturm-Liouville, Fourier, Hankel, Legendre, and other integral transforms. *Prereq.* Admission to graduate school.

ECE 3232 Mathematical Methods in Electrical Engineering 2-A **2 QH**
Fall Quarter

ECE 3232 and ECE 3233 cover the same material with the same prerequisites as ECE 3231, but in two 2 QH courses.

ECE 3233 Mathematical Methods in Electrical Engineering 2-B 2 QH
Winter Quarter
 Continues ECE 3232. *Prereq.* ECE 3232.

ECE 3241 Applied Probability and Stochastic Processes 4 QH
Fall and Winter Quarters
 Introduces probability, sample space and random variables, examples of discrete and continuous probability distribution functions, averages, moments and characteristic function, multivariate distributions, change of variables and functions of variables, central limit theorem, and description of stochastic vectors. Presents general concepts of stochastic processes: stationarity and ergodicity, stochastic continuity and differentiation, the Gaussian process, linear systems with stochastic inputs, correlation functions and power spectra, matched filtering, stochastic orthogonality and linear mean-square estimation filtering and prediction. *Prereq.* ECE 3108 or equiv.

ECE 3242 Applied Probability and Stochastic Processes A 2 QH
Fall and Winter Quarters
 ECE 3242 and ECE 3243 cover the same material with the same prerequisites as ECE 3241, but in two 2 QH courses.

ECE 3243 Applied Probability and Stochastic Processes B 2 QH
Winter and Spring Quarters
 Continues ECE 3242. *Prereq.* ECE 3242.

ECE 3302 Power Circuit Analysis 2 2 QH
Winter Quarter
 Continues ECE 3120. Considers sequence impedances of various power-system elements from an application point of view. Demonstrates unsymmetrical faults on otherwise symmetrical 3-phase systems, open conductors and asymmetrical connections and loadings. Analyzes simultaneous faults on 3-phase systems. *Prereq.* ECE 3120.

ECE 3303 Power Circuit Analysis 3 2 QH
Spring Quarter
 Continues ECE 3302. Introduces Clarke components and applications in analysis of asymmetrical systems and faults. Studies application of Clarke components to the solution of surge phenomena problems. Other topics include transmission line theory and fundamentals of systems stability. *Prereq.* ECE 3302.

ECE 3304 Solid State AC and DC Motor Control Systems 2 QH
Fall Quarter
 Focuses on the application of solid-state devices to the control of AC and DC electrical machinery including rectifiers, inverters, choppers, and cyclo-converters, as applied to drive systems in industry and transportation. Emphasizes a case method approach. *Prereq.* BSEE or ECE 3100 and ECE 3101 or equiv.

ECE 3305 Computers in Power Systems 1 2 QH
Fall Quarter
 Introduces techniques used in solving power system problems with the digital computer. Examines matrix formulations. Traces a detailed treatment of the short-circuit problem, including balanced and unbalanced faults. Explores various iterative techniques for the solution of the power-flow problem. *Prereq.* ECE 3120.

ECE 3306 Computers in Power Systems 2 2 QH
Winter Quarter
 Discusses practical considerations of solving large scale networks. Studies network reductions, distribution factors and contingency analysis techniques. Examines digital models for regulated generators, fixed and load tap changing transformers and HVDC transmission lines. Develops computer methods for economic dispatch, loss coefficients, and application of pumped hydro. *Prereq.* ECE 3305.

ECE 3308 Electrical Machinery Theory 2 2 QH
Winter Quarter
 Studies the mathematical description of a synchronous machine. Topics include per-unit representation, steady-state theory and transient performance, and flux distribution and saturation in synchronous machines. *Prereq.* ECE 3130.

ECE 3309 Electrical Machinery Theory 3 2 QH
Spring Quarter
 Reviews transient behavior of synchronous machines, stability studies and excitation systems, synchronous machine modeling, generator protection, and trends in development of large generators. *Prereq.* ECE 3308.

ECE 3311 Software Engineering 1 4 QH
Fall Quarter
 Introduces basic concepts in software engineering principles. Discusses techniques of structured software design and testing along with issues of program reliability and complexity. Surveys management techniques and explores a case study of a typical large software problem. *Prereq.* ECE 3105, ECE 3106, ECE 3107, or equiv., and a knowledge of a high-level programming language.

ECE 3312 Software Engineering 1-A 2 QH
Fall and Winter Quarters
 ECE 3312 and ECE 3313 cover the same material with the same prerequisites as ECE 3311, but in two 2 QH courses.

ECE 3313 Software Engineering 1-B 2 QH
Winter and Spring Quarters
 Continues ECE 3312. *Prereq.* ECE 3312.

ECE 3314 Software Engineering 2 2 QH
Spring Quarter
 Focus turns away from the general issues of the first two courses in this sequence and toward a very specific issue: modular design of software. Issues of stepwise refinement and top-down design are explored in depth, and organizational/data-flow issues are considered. *Prereq.* ECE 3311 or ECE 3313.

ECE 3321 Digital Signal Processing Winter and Spring Quarters Explores the theory and practice of modern signal processing techniques. Covers the characteristics of discrete signals and systems, sampling and A/D conversion, difference equations, and convolution. Considers the z-transform, the Fourier transform, the discrete Fourier transform, fast Fourier transform algorithms, and chirp z-transform algorithm. Other topics include digital filter realizations, design techniques for IIR and FIR digital filters, computer programs for filter design, and quantization effects in digital signal processing. <i>Prereq. ECE 3221.</i>	4 QH
ECE 3322 Digital Signal Processing A Fall and Winter Quarters ECE 3322 and ECE 3323 cover the same material with the same prerequisites as ECE 3321, but in two 2 QH courses.	2 QH
ECE 3323 Digital Signal Processing B Winter and Spring Quarters Continues ECE 3322. <i>Prereq. ECE 3322.</i>	2 QH
ECE 3325 Numerical Methods and Computer Applications 1 Winter Quarter Surveys numerical methods applied to engineering and scientific problems with emphasis on machine implementation and problem solving. Covers round-off errors and cumulative errors, systems of linear and nonlinear algebraic equations, roots of polynomials and nonlinear functions, orthogonal functions, least square Chebyshev approximation of functions. Covers interpolation, numeric quadrature, and ordinary and partial differential equations. <i>Prereq. Admission to graduate school and a working knowledge of FORTRAN.</i>	4 QH
ECE 3326 Numerical Methods and Computer Applications 1-A Fall and Winter Quarters ECE 3326 and ECE 3327 cover the same material with the same prerequisites as ECE 3325, but in two 2 QH courses.	2 QH
ECE 3327 Numerical Methods and Computer Applications 1-B Winter and Spring Quarters Continues ECE 3326. <i>Prereq. ECE 3326.</i>	2 QH
ECE 3328 Numerical Methods and Computer Applications 2 Spring Quarter Analyzes spectral analysis, including fast Fourier transforms, Hilbert transforms, convolution, and correlation techniques. Demonstrates optimization, including dynamic programming and steepest descent techniques. Covers PERT and linear programming. <i>Prereq. ECE 3325 or ECE 3327.</i>	2 QH
ECE 3331 Analog Integrated Circuits Fall Quarter Covers active transistor circuits and systems with emphasis on modern integrated circuit architectures. Presents bipolar and field-effect (NMOS and CMOS)	4 QH

implementations of analog circuits. Explores characteristics and behaviors of analog IC structures through the study of circuits such as operational amplifiers, instrumentation amplifiers, voltage comparators, various types of filter configuration and integrators, and multipliers and logarithmic amplifiers. Covers linearity, dynamic range, slew-rate limiting, and speed and gain bandwidth trade-offs. Traces the role of feedback in stabilizing, linearizing, and otherwise enhancing the performance of analog circuits. Explores noise limitations on circuit performance. Develops noise models of devices and circuits, leading to the prediction of system noise performance and techniques for optimizing signal-to-noise-ratios. *Prereq. ECE 3101 or equiv.*

ECE 3332 Analog Integrated Circuits A
Fall Quarter
ECE 3332 and ECE 3333 cover the same material with the same prerequisites as ECE 3331, but in two 2 QH courses.

ECE 3333 Analog Integrated Circuits B
Winter Quarter
Continues ECE 3332. *Prereq. ECE 3332.*

ECE 3341 Electromagnetic Theory 1
Fall Quarter
Emphasizes the fundamental equations, their physical meaning, principal mathematical techniques, and important engineering applications. Topics include sources of the EM field; Lorentz force equation; relations and point relations (differential equations and boundary conditions); electromagnetic energy and power; propagation of plane waves in homogeneous media; reflection and transmission; and scalar and vector potentials. Examines solutions in the absence of boundaries for static and dynamic problems, with or without symmetry. Also covers solutions to boundary value problems, Green's functions, transmission lines, resonators, and dielectric slab guide. *Prereq. ECE 3102 or equiv.*

ECE 3342 Electromagnetic Theory 1-A
Fall Quarter
ECE 3342 and ECE 3343 cover the same material with the same prerequisites as ECE 3341, but in two 2 QH courses.

ECE 3343 Electromagnetic Theory 1-B
Winter Quarter
Continues ECE 3342. *Prereq. ECE 3342.*

ECE 3344 Electromagnetic Theory 2
Winter Quarter
Examines important electrodynamic applications using advanced mathematical techniques. Covers the general theory of wave guides and resonators with application to cylindrical geometry. Discusses dielectric rod wave guides, optical fibers, radiation, linear antennas, loop antennas, linear arrays, and ray optics. Studies scattering and diffraction of waves for planar, cylindrical, and spherical geometries, as well as effects of random media. *Prereq. ECE 3341.*

- ECE 3345 Electromagnetic Theory 2-A** 2 QH
Winter Quarter
 ECE 3345 and ECE 3346 cover the same material with the same prerequisites as ECE 3344, but in two 2 QH courses.
- ECE 3346 Electromagnetic Theory 2-B** 2 QH
Spring Quarter
 Continues ECE 3345. *Prereq.* ECE 3345.
- ECE 3347 Computational Methods in Electromagnetics** 4 QH
Winter Quarter
 Presents solutions to problems in electromagnetics, using a variety of numerical and computational methods. Uses finite element methods to solve problems in electrostatics, diffusion, and wave propagation, and moment methods to solve the integral equations related to currents and charges on wire structures. Treats direct and inverse scattering by approximate methods related to physical and geometrical optics. Introduces computational methods for the asymptotic evaluation of radiation integrals and basically non-numerical solutions to integral equations in electromagnetics. Also examines electromagnetic data handling, sampling, and processing. *Prereq.* ECE 3341 and ECE 3344.
- ECE 3348 Computational Methods in Electromagnetics A** 2 QH
Fall Quarter
 ECE 3348 and ECE 3349 cover the same material with the same prerequisites as ECE 3347, but in two 2 QH courses.
- ECE 3349 Computational Methods in Electromagnetics B** 2 QH
Winter Quarter
 Continues ECE 3348. *Prereq.* ECE 3348.
- ECE 3351 Digital Communications** 4 QH
Winter Quarter
 Focuses on the theoretical and practical aspects of digital communications in the presence of channel distortion and additive noise. Topics include the basic binary and M-ary modulation techniques (PSK, PAM, FSK); orthogonal and biorthogonal signals, and their performance in an additive Gaussian noise channel; signal waveforms constructed from binary block and convolutional codes; hard-decision decoding and soft-decision decoding of coded signal waveforms, performance of coded waveforms in an additive white Gaussian noise channel; and trellis-coded modulation. *Prereq.* ECE 3241 and ECE 3104 or equiv.
- ECE 3352 Digital Communications A** 2 QH
Fall Quarter
 ECE 3352 and ECE 3353 cover the same material with the same prerequisites as ECE 3351, but in two 2 QH courses.
- ECE 3353 Digital Communications B** 2 QH
Winter Quarter
 Continues ECE 3352. *Prereq.* ECE 3352.

- ECE 3361 Detection and Estimation Theory** 4 QH
Winter Quarter
 Presents the classical theory of detection and estimation of signals in noise with emphasis on computer implementation of the theory, including hypothesis testing criteria, coherent detection of M-ary signals, diversity receiver, and calculation of error probabilities. Other topics include detection in colored noise, parameter estimation using Bayes, maximum-likelihood, a maximum a posteriori criteria, and applications of the theory to digital communications and radar. *Prereq.* ECE 3241.
- ECE 3362 Detection and Estimation Theory A** 2 QH
Winter Quarter
 ECE 3362 and ECE 3363 cover the same material with the same prerequisites as ECE 3361, but in two 2 QH courses.
- ECE 3363 Detection and Estimation Theory B** 2 QH
Spring Quarter
 Continues ECE 3362. *Prereq.* ECE 3362.
- ECE 3371 Linear Optimal Control Theory** 4 QH
Spring Quarter
 Covers analysis and design of linear multivariable feedback control systems. Emphasizes state space techniques, and addresses linear optimal regulators and observers, optimal output feedback, tracking and disturbance rejection, robustness analysis, and loop shaping. *Prereq.* ECE 3221 and ECE 3241.
- ECE 3372 Linear Optimal Control Theory A** 2 QH
Winter Quarter
 ECE 3372 and ECE 3373 cover the same material with the same prerequisites as ECE 3371, but in two 2 QH courses.
- ECE 3373 Linear Optimal Control Theory B** 2 QH
Spring Quarter
 Continues ECE 3372. *Prereq.* ECE 3372.
- ECE 3381 Classical Control Theory** 4 QH
Fall Quarter
 Surveys basic systems modeling and steady state and transient response analysis. Introduces root-locus plots, Bode plots, Nyquist plots, and Nichols chart, and discusses the design of first order cascade and feedback compensators using these plots. Other topics include pole-zero synthesis techniques and design techniques for the optimal linear regulator problem. *Prereq.* ECE 3108 or equiv.
- ECE 3382 Classical Control Theory A** 2 QH
Fall Quarter
 ECE 3382 and ECE 3383 cover the same material with the same prerequisites as ECE 3381, but in two 2 QH courses.
- ECE 3383 Classical Control Theory B** 2 QH
Winter Quarter
 Continues ECE 3382. *Prereq.* ECE 3382.

- ECE 3384 Characteristics and Models of Solid-State Devices 1** 4 QH
Winter Quarter
 Investigates the physics of semiconductors and the operation of semiconductor devices. Topics include crystal structure, energy bands, carrier concentration at thermal equilibrium, semiconductor statistics, carrier transport phenomena, p-n junction theory, charge storage and diode transients, bipolar junction transistors, charge-control model, and the Gummel-Poon model. *Prereq.* ECE 3101 or equiv.
- ECE 3385 Characteristics and Models of Solid-State Devices 1-A** 2 QH
Fall Quarter
 ECE 3385 and ECE 3386 cover the same material with the same prerequisites as ECE 3384, but in two 2 QH courses. *Prereq.* ECE 3101 or equiv.
- ECE 3386 Characteristics and Models of Solid-State Devices 1-B** 2 QH
Winter Quarter
 Continues ECE 3385. *Prereq.* ECE 3385.
- ECE 3388 Characteristics and Models of Solid-State Devices 2** 4 QH
Spring Quarter
 Analyzes metal-semiconductor contacts, methods of measurement of barrier height, MIS diode, C-V measurement to evaluate the interface-trapped charges. Discusses MOSFET device and structure, device scaling and second-order effects, CMOS structure, solid state microwave devices like MESFET, MODFET, and heterojunction bipolar transistor (HBT). Examines noise in the microwave devices. *Prereq.* ECE 3384.
- ECE 3389 Characteristics and Models of Solid-State Devices 2-A** 2 QH
 ECE 3389 and 3390 cover the same material with the same prerequisites as ECE 3388, but in two 2 QH courses. *Prereq.* ECE 3384.
- ECE 3390 Characteristics and Models of Solid-State Devices 2-B** 2 QH
 Continues ECE 3389. *Prereq.* ECE 3389.
- ECE 3391 Computer Architecture** 4 QH
 Deals with the design of new architectures as well as an understanding of those already extant. Considers both the hardware and system software that permit the system to deal with multiple processes sharing common resources, such as the processor, bus, primary memory, and disk storage. Topics include the operating system, caches and memory management, and I/O processing. Software topics include exercises in a small subset of VAX assembly language, typical HLL constructs and their translation to VAX assembly code, instructing and addressing mode frequencies, and consideration of the value of different data types. Introduces RISC and CISC architectures. Discusses issues concerning the subdivision of computational tasks and hard-wiring vs. microprogramming. Introduces details of a specific design to focus on solving such critical operations as pipeline design and efficient interrupt handling. *Prereq.* A good working knowledge of high-level language programming

(Pascal or C, for example), a course in logic (gates, minimization, sequential and combinatorial circuits), and at least a rudimentary idea of assembly language programming and how a computer functions internally.

- ECE 3392 Digital Computer Architecture A** 2 QH
Fall and Winter Quarters
 ECE 3392 and ECE 3393 cover the same material with the same prerequisites as ECE 3391, but in two 2 QH courses.
- ECE 3393 Digital Computer Architecture B** 2 QH
Winter and Spring Quarters
 Continues ECE 3392. *Prereq.* ECE 3392.
- ECE 3394 Microprogramming** 2 QH
Spring Quarter
 Reviews topics in microprogramming and emulation including microprogramming concepts and techniques; microprogramming design approach using register transfer notation and precedence graphs; microprogrammed computers; bit-slice microprogramming; microprogramming a specific machine for emulation using a microprogramming language and its simulator; and current trends in microprogramming languages and support tools. *Prereq.* ECE 3391 or ECE 3393.
- ECE 3395 VLSI Design** 4 QH
Fall Quarter
 Covers MOS devices and circuits, electrical and logic design, logic arrays, fabrication, design rules, electrical parameters, delays, NMOS and CMOS subsystem design. Covers laboratory design project including layout design and verification. *Prereq.* ECE 3101 and ECE 3103 or equiv.
- ECE 3396 VLSI Design A** 2 QH
Fall Quarter
 ECE 3396 and ECE 3397 cover the same material with the same prerequisites as ECE 3395, but in two 2 QH courses.
- ECE 3397 VLSI Design B** 2 QH
Winter Quarter
 Continues ECE 3396. *Prereq.* ECE 3396.
- ECE 3398 VLSI Architectures** 4 QH
Winter Quarter
 Covers system clocking and system design issues, control processing data path design, systolic arrays, bit serial architectures, and design for testability. Introduces silicon compilation. Includes lab project. *Prereq.* ECE 3395.
- ECE 3399 VLSI Architectures A** 2 QH
Winter Quarter
 ECE 3399 and ECE 3400 cover the same material with the same prerequisites as ECE 3398, but in two 2 QH courses. *Prereq.* ECE 3395.
- ECE 3400 VLSI Architectures B** 2 QH
Spring Quarter
 Continues ECE 3399. *Prereq.* ECE 3399.

ECE 3401 Digital Systems Design with Hardware Description Languages 4 QH
Spring Quarter

Covers design, simulation, modeling, and implementation of complex digital systems using high-level computer hardware description languages (HDL). Begins with a description of digital system design hierarchy and abstraction, followed by a brief overview of available design tools and simulation programs. Introduces HDLs, with emphasis on VHDL and AHPL, and investigates using these languages for design and verification of digital systems at different levels of abstraction. Explores the use of VHDL software for design and simulation of large digital circuits. Also addresses silicon compilation, computer-aided design, and automatic generation of hardware. *Prereq. ECE 3391.*

ECE 3402 Digital Systems Design with Hardware Description Languages A 2 QH
Fall Quarter

ECE 3402 and ECE 3403 cover the same material with the same prerequisites as ECE 3401, but in two 2 QH courses. *Prereq. ECE 3391.*

ECE 3403 Digital Systems Design with Hardware Description Languages B 2 QH
Winter Quarter

Continues ECE 3402. *Prereq. ECE 3402.*

ECE 3412 Power System Planning 4 QH
Spring Quarter

Investigates engineering and economic considerations underlying the planning and development of modern interconnected power systems. Considers overall planning strategies involved in economic comparison of alternative development schemes. *Prereq. ECE 3120.*

ECE 3415 Power System Protection 2 QH
Winter Quarter

Considers protection applied to generation, transmission, and distribution. Investigates the characteristics and operating principles of various methods of protective relaying, and analyzes current techniques pertaining to system protection. *Prereq. ECE 3303.*

ECE 3416 Power System Transients 2 QH
Fall Quarter

Examines transients in power systems due to system switching, lightning, or faults. Other topics include traveling-wave phenomena, insulation coordination, overvoltages due to disturbances on the system, and surge protection. *Prereq. ECE 3303.*

ECE 3423 Special Topics in Power 2 QH
Spring Quarter

Involves directed reading and discussion of topics of special interest in the power field. Presents series of lectures by guest speakers from industry on topics of particular interest to the power student. *Prereq. Permission of instructor.*

ECE 3424 Power System Dynamics 2 QH
Spring Quarter

Explores transient system models, small and large scale oscillations, solution of swing equation for single and multigenerator cases, load frequency and voltage controllers, and transient stability. *Prereq. ECE 3303.*

ECE 3430 Studies in Electric Power Transmission 1 2 QH
Fall Quarter

Covers elements in the design of AC overhead transmission lines: thermal limitation, series and shunt compensation, and environmental effects. Considers transposition, induced effects, and insulation level, as well as underground alternatives to overhead lines and elements of distribution. *Prereq. ECE 3303.*

ECE 3431 Studies in Electric Power Transmission 2 2 QH
Winter Quarter

Investigates fundamental concepts of high voltage DC power transmission, rectifier and inverter performance, regulation; protection, reactive power and filter requirements, practical arrangement of DC lines, and the impact of a DC line on overall power system operation. *Prereq. ECE 3303.*

ECE 3440 Microprocessor-System Design 4 QH
Spring Quarter

Explores designing and programming a microcomputer system, including bus interface and timing, interrupts, various peripheral chips, and debugging with the HP64000 emulator. *Prereq. ECE 3103 or equiv.*

ECE 3441 Microprocessor-System Design A 2 QH
Fall Quarter

ECE 3441 and ECE 3442 cover the same material with the same prerequisites as ECE 3440, but in two 2 QH courses.

ECE 3442 Microprocessor-System Design B 2 QH
Winter Quarter

Continues ECE 3441. *Prereq. ECE 3441.*

ECE 3443 Theory of Computation 4 QH
Spring Quarter

Focuses on basic abstract models of computation. Topics include Turing machines, primitive recursive functions, recursive systems of equations, and abstract families of algorithms. Examines unsolvable problems and the Recursion Theorem. *Prereq. ECE 3200.*

ECE 3444 Theory of Computation A 2 QH
Fall Quarter

ECE 3444 and ECE 3445 cover the same material with the same prerequisites as ECE 3443, but in two 2 QH courses.

ECE 3445 Theory of Computation B 2 QH
Winter Quarter

Continues ECE 3444. *Prereq. ECE 3444.*

ECE 3447 Switching Theory 1 4 QH
Spring Quarter

Discusses logical design of combinational switching circuits, including minimization and decomposition

of switching functions, multiple output networks, symmetric networks, threshold logic, and fault detection. Analyzes logic design of sequential switching circuits including finite-state machine model, iterative networks, capabilities and limitations of finite-state machines, state equivalence, synthesis of asynchronous sequential circuits, state assignment problem and partition theory, and machine decomposition. Explores logical design of sequential switching circuits, including the finite-state machine model, iterative networks, capabilities and limitations of finite-state machines, state equivalence, synthesis of asynchronous sequential circuits, state assignment problem and partition theory, and machine decomposition. *Prereq.* ECE 3200.

ECE 3448 Switching Theory 1-A **2 QH**
Fall Quarter

ECE 3448 and ECE 3449 cover the same material with the same prerequisites as ECE 3447, but in two 2 QH courses.

ECE 3449 Switching Theory 1-B **2 QH**
Winter Quarter

Continues ECE 3448. *Prereq.* ECE 3448.

ECE 3450 Switching Theory 2 **2 QH**
Spring Quarter

Surveys selected topics from the theory of finite automata, including such topics as machine experiments, information lossless machines, linear sequential machines, and finite-state recognizers. *Prereq.* ECE 3447 or ECE 3449.

ECE 3451 Combinatorial Methods and Optimization Techniques **4 QH**
Winter Quarter

Introduces applied combinatorial mathematics and treats selected topics in enumerative analysis. Topics include permutations, combinations, generating functions, recurrence relations, and the principle of inclusion and exclusion. Discusses Polya's theory of counting and selected topics in optimization techniques, which include transport networks, matching theory, and linear programming, and introduces dynamic programming. *Prereq.* ECE 3200.

ECE 3452 Combinatorial Methods and Optimization Techniques A **2 QH**
Winter Quarter

ECE 3452 and ECE 3453 cover the same material with the same prerequisites as ECE 3451, but in two 2 QH courses.

ECE 3453 Combinatorial Methods and Optimization Techniques B **2 QH**
Spring Quarter

Continues ECE 3452. *Prereq.* ECE 3452.

ECE 3454 Graph Theory **2 QH**
Spring Quarter

Introduces fundamentals of graph theory, including blocks, trees, connectivity, partitions, traversability, line graphs, factorization, coverings, planarity, matrices, digraphs, and enumeration problems. Explores selected applications of graph theory in such fields as

network theory, switching theory, and computer science. *Prereq.* ECE 3211.

ECE 3460 Special Topics in Computer Engineering **2 QH**
Spring Quarter

Investigates aspects of computer engineering not covered in other courses. The subject matter may change from year to year.

ECE 3463 Robot Vision and Sensors **4 QH**
Winter Quarter

Investigates methods of acquiring, representing, and processing real-world information for robot control. Covers robot vision: low-level vision, real-time image understanding, and theory of motion. Introduces high-level vision by examining problems associated with part acquisition, representation, and reorientation. Covers internal robot sensors, which monitor the state of robot systems, and external robot sensors, which allow the system to interact with its environment. Examines force/torque, touch, proximity, and tactile sensors. *Prereq.* ECE 3466.

ECE 3464 Robot Vision and Sensors A **2 QH**

ECE 3464 and ECE 3465 cover the same material with the same prerequisites as ECE 3463, but in two 2 QH courses.

ECE 3465 Robot Vision and Sensors B **2 QH**

Continues ECE 3464. *Prereq.* ECE 3464.

ECE 3466 Robotics and Automation Systems **4 QH**
Fall Quarter

Studies design and operation of general-purpose and industrial manipulator systems. Topics include robot mobility criteria, kinematic and dynamic models of mechanical arms, joint solutions and motion characteristics, trajectory planning, arm control through coordinate transformations, classical feedback methods, modern closed-loop control techniques, and real-time control of robotic systems. *Prereq.* ECE 3221.

ECE 3467 Robotics and Automation Systems A **2 QH**
Fall Quarter

ECE 3467 and ECE 3468 cover the same material with the same prerequisites as ECE 3466, but in two 2 QH courses.

ECE 3468 Robotics and Automation Systems B **2 QH**
Winter Quarter

Continues ECE 3467. *Prereq.* ECE 3467.

ECE 3469 Fault-Tolerant Computers **4 QH**
Winter Quarter

Examines concepts of computer systems structures and specifications, software and hardware interactions, failure and reliability, and errors and faults. Studies different types of faults: fault prevention and fault tolerance, redundancy management, reliability, and availability. Compares existing, fault-tolerant computer architectures such as SIFT, FTMP, Tandem 16, and Stratus/32. Covers techniques of error detection and error recovery, mechanisms for damage confinement, and damage assessment. Studies software fault tolerance techniques such as recovery block scheme, deadline mechanism, and N-version programming scheme. *Prereq.* ECE 3391.

ECE 3470 Fault-Tolerant Computers A 2 QH
Winter Quarter

ECE 3470 and ECE 3471 cover the same material with the same prerequisites as ECE 3469, but in two 2 QH courses.

ECE 3471 Fault-Tolerant Computers B 2 QH
Spring Quarter

Continues ECE 3470. *Prereq.* ECE 3470.

ECE 3472 Special Topics in Robotics 4 QH
Spring Quarter

Focuses on dynamic analysis of manipulator motion, closed-form dynamic robot model construction, and real-time model optimization. Analyzes the influence of actuator models complexity on manipulator control. Also examines adaptive and non-adaptive control of manipulator robots with variable parameters, controllability and stability analysis, state space constraints and avoidance of obstacles, and adaptive identification of states, parameters, and variable payload. *Prereq.* ECE 3466.

ECE 3473 Parallel Architecture for Signal Processing 4 QH
Fall Quarter

Investigates parallel processing techniques for real-time signal/image processing applications, data flow analysis for parallelism extraction, and mapping algorithms to architectures, as well as linear, 2-D, and 3-D systolic/wavefront arrays, partitioning and matching algorithms to fixed-size arrays. Studies adaptive filtering, array beam-forming, speech/character recognition, image processing, and graph theoretic problems. Includes concurrent languages for parallel processing, design tools for parallel architectures, mapping automation, array compilers. Deals with run-time fault tolerance issues in processor arrays, neurocomputing models for signal/image processing, deriving parallel architectures for neural networks, and VLSI implementation issues.

ECE 3476 Special Topics in Fault-Tolerant Computing 4 QH
Winter Quarter

Focuses on fault-tolerant VLSI/WSI processor arrays: fault and error models for VLSI, reconfiguration techniques for run-time fault tolerance, graceful degradation, transient fault recovery, time redundancy, fabrication, and compile time array restructuring for yield enhancement in wafer scale integration arrays. Covers unifying fault tolerance with mapping algorithms to VLSI array structures and tools for designing fault-tolerant architectures. Studies fault-tolerant communication structures such as reliable shared memory and message-passing mechanisms, fault-tolerant loops, trees, and hypercubes. Includes dynamically reconfigurable networks, system-level diagnosis, diagnosability and analysis (the PMC model), distributed diagnosis, software fault tolerance, N-version programming, and recovery blocks. *Prereq.* ECE 3469 or permission of instructor.

ECE 3500 Auditory Signal Processing 4 QH
Fall Quarter, As Announced

Provides engineers interested in processing and producing audio signals with how sounds are processed and perceived in the auditory system by exploring physiological and psychological acoustics. Emphasizes mathematical models of the auditory system. Topics include properties of acoustical stimuli; anatomy and physiology of the auditory system; electrical recordings from the auditory system; methods of psychophysical measurements; absolute thresholds; temporal integration; masking and auditory frequency analysis; signal detection theory and models of masking; frequency and intensity discrimination; models of intensity discrimination; experiments and models on temporal processing; loudness; Zwicker's loudness summation model; pitch of simple and complex tones; models of pitch perception; binaural hearing; other perceptual continua; and timbre, roughness, noisiness, and annoyance. Covers the auditory processes that govern perception of sounds and are fundamental to our ability to understand speech. *Prereq.* ECE 3241 or equiv.

ECE 3502 Special Topics in Digital Signal Processing-Fast Algorithms 2 QH
Fall Quarter

Surveys fast algorithms for implementation of digital filters and discrete Fourier transforms: FFT, convolution algorithm, Number Theoretic Transforms (NTT), filtering computation, and polynomial transforms. *Prereq.* ECE 3321.

ECE 3503 Two-Dimensional Digital Signal Processing 2 QH
Winter Quarter

Two-dimensional digital signal processing is finding wide applications in many diversified areas. Covers 2-D shift invariant systems along with their stability, the 2-D Discrete Fourier Transform (DFT) and its FFT implementation, and 2-D digital filter design and implementation. *Prereq.* ECE 3321.

ECE 3505 Digital Image Processing 4 QH
Spring Quarter

Discusses generation of digital image from the source, image digitizers and display devices, image transforms, enhancement techniques such as histogram, equalization, and edge sharpening. Other topics include restoration by Wiener and Kalman filters, image coding using run length coding, DPCM, transform coding, and feature analysis. *Prereq.* ECE 3321.

ECE 3506 Digital Image Processing A 2 QH
Fall Quarter

ECE 3506 and ECE 3507 cover the same material with the same prerequisites as ECE 3505, but in two 2 QH courses.

ECE 3507 Digital Image Processing B 2 QH
Winter Quarter

Continues ECE 3506. *Prereq.* ECE 3506.

ECE 3508 Modern Spectral Analysis Fall Quarter	4 QH
Introduces conventional methods of spectrum estimation, periodogram and autocorrelation methods with their smooth versions, the maximum likelihood method of Capon and its modifications, and the maximum entropy method with and without uncertainty in the correlation measurements. Demonstrates the Levinson algorithm, the minimum energy method, weighted Burg techniques, forward-backward least-squares, covariance least-squares, moving average (MA) and ARMA spectrum estimation, model order selection criteria, and harmonic decomposition methods: Prony, Pisarenko, and singular value decomposition methods. Introduces multichannel conventional spectrum estimation techniques, parametric modeling of multichannel time series, the Levinson-Wiggins-Robinson algorithm, and multichannel AR spectrum estimation techniques. <i>Prereq. ECE 3321.</i>	
ECE 3509 Modern Spectral Analysis A Fall Quarter	2 QH
ECE 3509 and 3510 cover the same material with the same prerequisites as ECE 3508, but in two 2 QH courses. <i>Prereq. ECE 3321.</i>	
ECE 3510 Modern Spectral Analysis B Winter Quarter	2 QH
Continues ECE 3509. <i>Prereq. ECE 3509.</i>	
ECE 3511 Data Communications Networks Spring Quarter	4 QH
Traces elements of computer-communication networks; network topology and design; elements of protocols, routing, and network control; and queuing and congestion control. Describes and compares several existing computer networks. <i>Prereq. ECE 3241.</i>	
ECE 3512 Data Communications Networks A Winter Quarter	2 QH
ECE 3512 and ECE 3513 cover the same material with the same prerequisites as ECE 3511, but in two 2 QH courses.	
ECE 3513 Data Communications Networks B Spring Quarter	2 QH
Continues ECE 3512. <i>Prereq. ECE 3512.</i>	
ECE 3514 Error Correcting Codes Spring Quarter	4 QH
Covers error correcting codes and their decoding techniques which show promise for applications in digital communication, control, and computer systems. Emphasizes linear block codes based on algebraic structures; cyclic codes for random error correction (B-C-H codes) and burst error correction. Other topics include convolutional codes and decoding including the Viterbi algorithm, arithmetic codes, combination of codes, and coding for ranging and synchronization. <i>Prereq. ECE 3211.</i>	
ECE 3515 Error Correcting Codes A Winter Quarter	2 QH
ECE 3515 and ECE 3516 cover the same material with the same prerequisites as ECE 3514, but in two 2 QH courses.	

ECE 3516 Error Correcting Codes B Spring Quarter	2 QH
Continues ECE 3515. <i>Prereq. ECE 3515.</i>	
ECE 3517 Information Theory A Winter Quarter	2 QH
ECE 3517 and ECE 3518 cover the same material with the same prerequisites as ECE 3519, but in two 2 QH courses.	
ECE 3518 Information Theory B Spring Quarter	2 QH
Continues ECE 3517. <i>Prereq. ECE 3517.</i>	
ECE 3519 Information Theory Fall Quarter	4 QH
Offers an information theorist's viewpoint of communication systems. Covers concepts, definitions, and results concerning mutual information and entropy for discrete and continuous alphabets. Examines channel capacity and the converse to the coding theorem for discrete memoryless channels; Blahut/Arimoto algorithm for calculating channel capacity; random channel coding concepts; the random coding exponent; and the coding theorem for a noisy channel. Discusses critical rate, cutoff rate, and capacity for system design. Other topics include source coding of continuous and discrete sources, rate-distortion theory, and variable-length source coding via Huffman's algorithm. <i>Prereq. ECE 3241 and ECE 3351.</i>	
ECE 3520 Special Topics in Communication Theory Spring Quarter	2 QH
Explores current aspects of communication theory not covered in previous courses. Subject matter may change from year to year. <i>Prereq. ECE 3241 and ECE 3351.</i>	
ECE 3521 Multidimensional Spectrum Estimation Spring Quarter	2 QH
Introduces stationary random fields and their spectrum representation, plane waves and their frequency-wavenumber spectrum, conventional methods (FFT based) and m-d window functions, m-d maximum likelihood method of Capon. Presents 2-D maximum entropy methods, the extendability problem in spectrum estimation, and m-d parametric models for spectrum estimation: separable methods, m-d AR methods, techniques based on minimum variance representations, 2-D ARMA methods, and the m-d Prony and Pisarenko methods. <i>Prereq. ECE 3503 and ECE 3508.</i>	
ECE 3522 Array Signal Processing Spring Quarter	2 QH
Covers array systems: configurations, cost, complexity, narrowband and wideband systems. Explores problem formulation, duality between spectrum estimation and array processing, and array processing methods: beamforming, minimum variance distortionless, autoregressive, thermal noise, and music. Other topics include coherent versus incoherent sources, adaptive array processing, sidelobe cancellation, interference rejection, LMS algorithm,	

wideband array processing techniques, applications to sonar, radar, geophysics, and biomedicine. *Prereq.* ECE 3321.

ECE 3523 Communication Systems 4 QH
Fall Quarter

Focuses on radio communication systems as used in terrestrial and space communication applications. Investigates antenna gain, space loss, cosmic and atmospheric noise, and receiver noise as factors influencing the signal-to-noise ratio in space and satellite repeater systems. Discusses contemporary systems from the standpoint of signal spectrum, noise power and message ambiguity as exhibited at the output of the intermediate frequency receiver. Introduces the theoretical aspects of amplitude and angle modulation systems to cover multiplex systems, signal-to-noise ratio analysis of frequency multiplex systems, and time division multiplex systems. Covers digital systems including sampling, aliasing, and PCM/FM. Considers bit-stream organization for transmission. Discusses a PCM encoder as a means of matching the bit-stream to the bandwidth. Examines contemporary communications systems used on balloons, rockets, and satellite repeaters. *Prereq.* ECE 3241 and ECE 3104 or equiv.

ECE 3524 Communication Systems A 2 QH
Fall Quarter

ECE 3524 and ECE 3525 cover the same material with the same prerequisites as ECE 3523, but in two 2 QH courses.

ECE 3525 Communication Systems B 2 QH
Winter Quarter

Continues ECE 3524. *Prereq.* ECE 3524.

ECE 3526 Nonlinear Systems 4 QH
Fall Quarter, As Announced

Investigates operators and functionals, functional power series representation of nonlinear systems, functional representation of the response of a nonlinear system when its input is either a constant, a sinusoid, or a transient. Discusses system transforms and applications to the analysis and synthesis of nonlinear systems in terms of functional power series. Covers nonlinear systems with random inputs and functional representation of the response of a nonlinear system when its input is a random process. Considers orthogonal systems of functionals and representation and analysis of nonlinear systems in terms of orthogonal systems of functionals. Other topics include the optimum nonlinear filter, predictor, and general operator; special classes of nonlinear systems; and determination of optimum nonlinear systems for generalized error criteria. *Prereq.* ECE 3241 and ECE 3221.

ECE 3527 Nonlinear Systems 1-A 2 QH
Fall Quarter, As Announced

ECE 3527 and ECE 3528 cover the same material with the same prerequisites as ECE 3526, but in two 2 QH courses.

ECE 3528 Nonlinear Systems 1-B 2 QH
Winter Quarter, As Announced

Continues ECE 3527. *Prereq.* ECE 3527.

ECE 3529 Nonlinear Systems 2 2 QH
Spring Quarter, As Announced

Studies functional analysis of systems characterized by nonlinear differential equations. Uses operator approach to system theory and its relationship to differential equation representations. Discusses the methods of iteration in nonlinear theory and its application to feedback systems. *Prereq.* ECE 3528.

ECE 3530 Three-Dimensional Picture Processing 2 QH
Spring Quarter, As Announced

Focuses on the application of computer, optical, and analytic methods in abstracting geometrical information from pictures. Examines the pictorial presentation of data trains into multidimensional pictures and reconstructing of three-dimensional objects from two-dimensional pictures. Discusses applications of X-ray analysis, radar target identification, microscopy, and sensory perception. Students will have the chance to pursue individual projects during the term. *Prereq.* ECE 3321.

ECE 3531 Adaptive Signal Processing 4 QH
Fall Quarter

Introduces optimum filtering (Wiener-Kalman), signal and system modeling using linear prediction, adaptive filtering (FIR, IIR), fast algorithms for least squares adaptive filters, adaptive array processing, and VLSI architectures for adaptive signal processing. *Prereq.* ECE 3321.

ECE 3532 Adaptive Signal Processing A 2 QH
Fall Quarter

ECE 3532 and ECE 3533 cover the same material with the same prerequisites as ECE 3531, but in two 2 QH courses. *Prereq.* ECE 3321.

ECE 3533 Adaptive Signal Processing B 2 QH
Winter Quarter

Continues ECE 3532. *Prereq.* ECE 3532.

ECE 3534 Digital Signal Processing of Speech Signals 4 QH
Spring Quarter

Emphasizes the analysis and recognition of speech using computer techniques. Introduces speech physiology, linguistics, phonetics, and acoustics. Examines models of speech production. Other topics include short-term processing of speech (temporal features, Fourier analysis, applications), theory of linear predictive coding and applications, homomorphic analysis of speech and applications, and speech and speaker recognition. *Prereq.* ECE 3321.

ECE 3535 Digital Processing of Speech Signals A 2 QH
Fall Quarter

ECE 3535 and ECE 3536 cover the same material with the same prerequisites as ECE 3534, but in two 2 QH courses. *Prereq.* ECE 3321.

ECE 3536 Digital Processing of Speech Signals B 2 QH
Winter Quarter

Continues ECE 3535. *Prereq.* ECE 3535.

ECE 3537 Multi-User Communication Systems 4 QH
Spring Quarter

Discusses contention-free multiple-access techniques: frequency-division multiple-access (FDMA), and time-division multiple-access (TDMA). Explores spread-spectrum multiple-access (SSMA) communications: Direct-sequence SSMA, frequency-hop SSMA, and hybrid SSMA systems. Analyzes communication networks: queuing theory, multiple-access with contention (ALOHA random-access and tree algorithms for random-access), and network routing and flow control (quasi-static control versus dynamic control). Surveys applications of multi-user communication systems: computer-communication networks, broadcast satellite systems, military communications, mobile radio communications, packet-radio communication networks, and fiber-optic local-area networks. *Prereq. ECE 3351.*

ECE 3538 Multi-User Communication Systems A 2 QH
Winter Quarter

ECE 3538 and ECE 3539 cover the same material with the same prerequisites as ECE 3537, but in two 2 QH courses. *Prereq. ECE 3351.*

ECE 3539 Multi-User Communication Systems B 2 QH
Spring Quarter

Continues ECE 3538. *Prereq. ECE 3538.*

ECE 3540 Digital Control Systems 4 QH
Winter Quarter

Analyzes linear discrete-time dynamic systems, discretization of continuous systems, sampling and aliasing. Considers design of digital control systems using transform techniques by discrete equivalent and direct design methods: root locus, Bode and Nyquist diagrams, and Nichols charts. Other topics include multivariant digital control using state-space methods: pole placement, observer, and regulator design; controller implementation issues: digital filter realizations, nonlinear effects due to quantization, roundoff, deadband, and limit cycles; selection of the sampling rate. *Prereq. ECE 3221 and ECE 3381.*

ECE 3541 Digital Control Systems A 2 QH
Fall Quarter

ECE 3541 and ECE 3542 cover the same material with the same prerequisites as ECE 3540, but in two 2 QH courses.

ECE 3542 Digital Control Systems B 2 QH
Winter Quarter

Continues ECE 3541. *Prereq. ECE 3541.*

ECE 3543 Stochastic Control Systems 4 QH
Fall Quarter

Presents techniques and results of modern stochastic system theory: basics of continuous-time stochastic processes; Markov processes; diffusion processes and drift; solution concepts, Ito integrals, and the Ito formula; fundamentals of martingales; stochastic stability; state estimation and nonlinear filtering; stochastic control; linear stochastic systems: the Kalman filter and LQG control; and application areas. *Prereq. ECE 3241.*

ECE 3544 Stochastic Control Theory A 2 QH
Fall Quarter

ECE 3544 and ECE 3545 cover the same material with the same prerequisites as ECE 3543, but in two 2 QH courses.

ECE 3545 Stochastic Control Theory B 2 QH
Winter Quarter

Continues ECE 3544. *Prereq. ECE 3544.*

ECE 3546 Advanced Topics in Stochastic and Nonlinear Systems 4 QH
Winter Quarter

Focuses on current research topics in stochastic systems and nonlinear dynamics. May cover large deviations and stochastic optimization, stochastic stability, global dynamics, bifurcations and singular perturbations, and nonlinear circuits. *Prereq. ECE 3543.*

ECE 3547 Advanced Topics in Stochastic and Nonlinear Systems A 2 QH
Winter Quarter

ECE 3547 and ECE 3548 cover the same material with the same prerequisites as ECE 3546, but in two 2 QH courses.

ECE 3548 Advanced Topics in Stochastic and Nonlinear Systems B 2 QH
Spring Quarter

Continues ECE 3547. *Prereq. ECE 3547.*

ECE 3549 Multivariable Control Systems 4 QH
Spring Quarter

Covers mathematical preliminaries, polynomials, and polynomial matrices; representations of linear multivariable system; matrix fraction description (MFD) and polynomial matrix description (PMD); responses of linear multivariable systems; controllability, observability, and canonical forms; and poles and zeros of multivariable systems. Examines also stability, realization problems, interaction control, state feedback and observer design, compensator design, stability and robustness, noninteraction control, and frequency domain design techniques. *Prereq. ECE 3221 and ECE 3381.*

ECE 3550 Multivariable Control Systems A 2 QH
Fall Quarter

ECE 3647 and ECE 3648 cover the same material with the same prerequisites as ECE 3646, but in two 2 QH courses. *Prereq. ECE 3321 and ECE 3381.*

ECE 3551 Multivariable Control Systems B 2 QH
Winter Quarter

Continues ECE 3550. *Prereq. ECE 3647.*

ECE 3552 System Identification and Adaptive Control 4 QH
Fall Quarter

Identification is the process of mathematically modeling a system based on measurement data that may be limited or uncertain. Adaptive control, then, is the means whereby a system that is poorly modeled is controlled adequately. The purpose of the system identification portion of the course is to enhance underlying basic ideas essential for adaptive control. Particular emphasis is given to recursive approaches,

such as recursive least square algorithm, where parameter estimates are updated in real-time. The adaptive control portion of the course covers simple adaptive systems, adaptive observers, and adaptive control. Treats two major adaptive schemes — namely, Model Reference Adaptive Control (MRAC) and Self-Tuning Regulators (STR) — in detail. Discusses fundamental issues such as stability of adaptive systems, convergence, persistent excitation, and robustness. An important by-product of the course is learning to identify several points of tangencies between two areas of control systems and signal processing. *Prereq. ECE 3221 and ECE 3321.*

ECE 3560 Acoustics 1 2 QH

Fall Quarter

Introduces the wave theory of sound including radiation, reflection, and transmission phenomena, distributed system analogies, and sound measurements. *Prereq. ECE 3341.*

ECE 3561 Acoustics 2 2 QH

Winter Quarter

Investigates speech and hearing, microphones and loudspeakers, guided waves, room acoustics, and environmental acoustics. *Prereq. ECE 3560.*

ECE 3562 Acoustics 3 2 QH

Spring Quarter

Focuses on scattering and diffraction, effects of viscosity and heat conduction, and finite amplitude and shock waves. Introduces underwater sound. *Prereq. ECE 3561.*

ECE 3563 Radar Systems 1 4 QH

Winter Quarter

Emphasizes systems aspects of radar engineering. Topics include basic theory of radar detection; measurement of range, angle, and Doppler shift; classes of radar systems; types of radar noise; components of a radar system; matched filters and correlation receivers as applied to radar systems; and fundamental ideas of radar system analysis. Also studies search radar theory; maximum likelihood estimation approach to measurement of radar target parameters; resolution and ambiguity functions applied to radar; and radar parameter uncertainty principles. *Prereq. ECE 3241.*

ECE 3564 Radar Systems 1-A 2 QH

Fall Quarter

ECE 3564 and ECE 3565 cover the same material with the same prerequisites as ECE 3563, but in two 2 QH courses. *Prereq. ECE 3241.*

ECE 3565 Radar Systems 1-B 2 QH

Winter Quarter

Continues ECE 3564. *Prereq. ECE 3564.*

ECE 3566 Radar Systems 2 2 QH

Spring Quarter

Presents advanced topics in radar systems engineering. Topics include design considerations for multistatic radar systems and synthetic aperture radars; tracking systems; radar wave form synthesis;

multifunction array radar techniques; and selected topics in radar sensing techniques and devices.

Prereq. ECE 3563 or ECE 3565.

ECE 3571 Fourier Optics

4 QH

Fall Quarter

Covers optical diffraction and imaging problems as linear systems; necessary tools of Fourier analysis and linear systems analysis for solving the scalar wave equation; waves and their properties; and reflection, refraction, polarization, and propagation of waves. Also examines foundations of scalar diffraction theory, including Fresnel and Fraunhofer diffraction, interferometry, division of amplitude, division of wavefront, interferometric instrumentation, Fourier transforming, image properties of lenses, and coherent and incoherent imaging; and advanced topics in the application of communication theory to optical problems, transfer and spread functions, spatial filtering, and holography. *Prereq. ECE 3581.*

ECE 3572 Fourier Optics 1-A

2 QH

Winter Quarter

ECE 3572 and ECE 3573 cover the same material with the same prerequisites as ECE 3571, but in two 2 QH courses. *Prereq. ECE 3581 or ECE 3582.*

ECE 3573 Fourier Optics 1-B

2 QH

Spring Quarter

Continues ECE 3572. *Prereq. ECE 3572.*

ECE 3574 Fourier Optics 2

2 QH

Fall Quarter

Covers current topics of interest in Fourier optics and optical instrumentation. Examines application of coherence phenomena to optical instrumentation such as microdensitometers, microscopes, viewers, cameras, spectrophotometric and interferometric instruments. Other topics include applications of holography, optical data processing and computing, holographic memories, optical modulation, noise and its effects on data collection, synthetic aperture optics, and medical application of laser optics. *Prereq. ECE 3573 or ECE 3571.*

ECE 3576 Lasers 1

2 QH

Fall Quarter

Reviews basic optical principles and atomic physics. Introduces optical coherence, models for the interaction of electromagnetic radiation with matter, and lasers. *Prereq. ECE 3341.*

ECE 3577 Lasers 2

2 QH

Winter Quarter

Investigates laser threshold and rate equations, elementary resonator theory and fabrication, giant pulse operation, specific solid-state, liquid, and gas lasers, and laser systems. *Prereq. ECE 3576.*

ECE 3578 Lasers 3

2 QH

Spring Quarter

Surveys applications of lasers and laser systems for a variety of engineering and basic science disciplines. Examines specific laser optoelectronic devices. *Prereq. ECE 3577.*

- ECE 3579 Optoelectronics and Fiber Optics** 2 QH
Winter Quarter
 Analyzes elements and characteristics in optical communication systems including elements which generate, transfer, and detect optical signals. Topics include resonance and guiding phenomena, semiconductor physics, LEDs, lasers, diode detectors, optical waveguide theory and design, and optical communication systems criteria. *Prereq. ECE 3580.*
- ECE 3580 Electro-Optics 1** 2 QH
Spring Quarter
 Surveys the basic concepts necessary for understanding and evaluating the optics involved in electro-optical systems. Focuses on the optical system as a linear system, matrix methods, diffraction and interference, and imaging and aberrations. *Prereq. BS degree in engineering or physics.*
- ECE 3581 Electro-Optics 2** 2 QH
Fall Quarter
 Surveys the basic concepts necessary for understanding electro-optical devices. Topics include wave propagation in isotropic and nonisotropic media, optics of crystals, polarization, optical resonators, guided waves, modulators and detectors, and thin-film optics. *Prereq. ECE 3580.*
- ECE 3582 Electro-Optics** 4 QH
Spring Quarter
 Covers the same material as in ECE 3580 and ECE 3581. *Prereq. BS degree in engineering or physics.*
- ECE 3583 Optical Properties of Matter 1** 2 QH
Fall Quarter
 Introduces the optics of crystals: classification and effects of crystal symmetry on optical properties, classical description of wave propagation in crystals, applications of the theory to modulation, pulse generation, and nonlinear optics. *Prereq. BS degree in engineering or physics.*
- ECE 3584 Optical Properties of Matter 2** 2 QH
Winter Quarter
 Introduces electro-optical and magneto-optical effects in material media: linear and nonlinear optical materials, elasto-optic and acousto-optical materials, polarization and propagation effects, and modulation. *Prereq. ECE 3583.*
- ECE 3585 Optical Properties of Matter 3** 2 QH
Spring Quarter
 Covers thin films and optical fibers, multilayer filters, dichroics, and integrated optics. *Prereq. ECE 3584.*
- ECE 3586 Principles of Optical Detection** 4 QH
Spring Quarter
 Emphasizes the detector as a component of an optical system. Topics include the laws governing radiation and radiometry; properties of real radiation sources; detailed descriptions of detection devices, noise, contrast, and MTF; imaging and ranging devices; and electro-optical detector systems analysis. Also includes practical consideration of real detectors, resolution and recognition of signals, heterodyne detection, sub-nano second pulse detection, and

calibration of electro-optical detectors. *Prereq. BS degree in engineering or physics.*

ECE 3587 Principles of Optical Detection A 2 QH
Winter Quarter

ECE 3587 and ECE 3588 cover the same material with the same prerequisites as ECE 3586, but in two 2 QH courses. *Prereq. BS degree in engineering or physics.*

ECE 3588 Principles of Optical Detection B 2 QH
Spring Quarter

Continues ECE 3587. *Prereq. ECE 3587.*

ECE 3589 Optical Storage and Display 2 QH
Fall Quarter

Surveys materials and methods for the storage and display of information. Topics include photographic film, holograms, storage tubes, magneto-optical films, photochromic materials, electro-optical crystals, evaporated thin films, and liquid crystals. *Prereq. BS degree in engineering or physics.*

ECE 3590 Optical Instrumentation Design 2 QH
Fall Quarter

Introduces the design of optical instrumentation and principles and basic concepts of optical systems. Topics include mechanical shock and vibration, kinematic designs, application of third-order aberrations, simple optical ray tracing, optical testing, tolerances, optical instrumentation, philosophy, functional design, design for quantity production, quality assurance, "special order" design, and industrial design. *Prereq. BS degree in engineering or physics.*

ECE 3591 Spectroscopic Instrumentation 2 QH
Winter Quarter

Surveys optical instrumentation employed in analysis and control situations. Examines modern methods of spectrometry and interferometry, optimization of analytical systems, topics in electron spectroscopy, X-ray spectroscopy, microwave spectroscopy, and related fields. *Prereq. ECE 3581.*

ECE 3592 Remote Sensing 2 QH
Spring Quarter, As Announced

Focuses on electromagnetic fundamentals related to passive and active remote sensing of the earth. Covers geophysical exploration techniques, radar fundamentals and radar scattering, and instrumentation and data processing. *Prereq. ECE 3341.*

ECE 3593 Plasma Engineering 4 QH
Fall Quarter, As Announced

Reviews the basic principles and applications of plasma and gaseous discharges. Topics include gas kinetics, interaction of electrons and ions with static and rf fields, and wave propagation in plasmas. Discusses applications in material processing, space exploration and microwave devices. *Prereq. ECE 3341.*

ECE 3594 Plasma Theory 4 QH
Winter Quarter, As Announced

Introduces the basic theory of gaseous discharges. Examines fluid and kinetic description of collisionless and collisional plasmas with and without magnetic field effects. Emphasizes linear stability analysis

although nonlinear effects will also be discussed. *Prereq.* ECE 3341.

ECE 3595 Plasma Theory A 2 QH
Winter Quarter, As Announced

ECE 3595 and ECE 3596 cover the same material with the same prerequisites as ECE 3594, but in two 2 QH courses.

ECE 3596 Plasma Theory B 2 QH
Spring Quarter, As Announced

Continues ECE 3595. *Prereq.* ECE 3595.

ECE 3597 Optical Properties of Matter 4 QH
Fall Quarter

Embodies the material in ECE 3583 and ECE 3584.

ECE 3600 Microwave Properties of Materials 4 QH
Fall Quarter

Covers general dielectric and magnetic properties of materials, tensor properties of dielectric and magnetic materials, special microwave properties of thin film materials, and experimental techniques developed in the characterization of microwave materials. *Prereq.* ECE 3102 and ME 1386 or equiv.

ECE 3601 Microwave Properties of Materials A 2 QH
Fall Quarter

ECE 3601 and ECE 3602 cover the same material with the same prerequisites as ECE 3600, but in two 2 QH courses. *Prereq.* ECE 3102, ME 1326, or equiv.

ECE 3602 Microwave Properties of Materials B 2 QH
Winter Quarter

Continues ECE 3601. *Prereq.* ECE 3601.

ECE 3603 Propagation in Artificial Structures 4 QH

Covers effective dielectric and permeability constants in composite materials at high frequencies, electromagnetic wave propagation in electrical and magnetic anisotropic media, magnetostatic and magneto-elastic wave propagation in single layer, and electromagnetic wave propagation in multi-layers. *Prereq.* ECE 3102 or equiv.

ECE 3604 Propagation in Artificial Structures A 2 QH
Winter Quarter

ECE 3604 and ECE 3605 cover the same material with the same prerequisites as ECE 3603, but in two 2 QH courses.

ECE 3605 Propagation in Artificial Structures B 2 QH
Spring Quarter

Continues ECE 3604. *Prereq.* ECE 3604.

ECE 3606 Applications of Plasma Engineering 4 QH
Spring Quarter, As Announced

Covers basic operational principles of microwave electron devices, the theory of electric domain formation, free electron and gaseous lasers, particle beam accelerators, and radiation sources. Topics include both classical microwave devices such as magnetrons, gyrotrons, and crossed-field amplifiers, and solid-state devices such as Gunn diodes and Impatt diodes. *Prereq.* ECE 3593.

ECE 3607 Applications of Plasma Engineering A 2 QH
Winter Quarter, As Announced

ECE 3607 and ECE 3608 cover the same material with the same prerequisites as ECE 3606, but in two 2 QH courses. *Prereq.* ECE 3593.

ECE 3608 Applications of Plasma Engineering B 2 QH
Spring Quarter, As Announced

Continues ECE 3607. *Prereq.* ECE 3607.

ECE 3609 Special Topics in Electromagnetics 4 QH
As Announced

Concentrates on inverse problems associated with multidimensional wave equations such as the Schrodinger equation, Maxwell equations, and the elastic-wave equation. Develops the theories using both the operator formalism employed in electromagnetic and acoustic scattering theory. Topics include the inverse Sturm Liouville problem, the deterministic and random inverse source problems, inverse diffraction, and the multidimensional inverse scattering problem. Accompanies the theoretical development with a thorough review of current applications of inverse scattering theory, including structure determination using X-rays and electron probes, S-ray holography, geophysical prospecting and remote sensing, coherent radar imaging, and diffraction tomography. *Prereq.* ECE 3231 and permission of instructor.

ECE 3610 Electronics of Analog Signal Processing 4 QH
Spring Quarter, As Announced

Studies analog signal acquisition and processing utilizing state of the art devices and circuit techniques such as adaptive filters in sampled data systems, CZTs for spectral analysis, correlated double sampling for improved S/N ratios, and solid-state imaging systems. Covers linear and nonlinear processing with MOS, bipolar, and CTDs such as CCDs and SAWs. Demonstrates analog versus digital approaches for implementation of similar applications, such as bandwidth requirements, throughput, accuracy, and cost. *Prereq.* ECE 3331 and ECE 3384.

ECE 3611 Electronics of Analog Signal Processing A 2 QH
Fall Quarter, As Announced

ECE 3611 and ECE 3612 cover the same material with the same prerequisites as ECE 3610, but in two 2 QH courses.

ECE 3612 Electronics of Analog Signal Processing B 2 QH
Winter Quarter, As Announced

Continues ECE 3611. *Prereq.* ECE 3611.

ECE 3613 Solid-State Microwave Circuits 4 QH
Spring Quarter, As Announced

Covers microwave circuit and analysis and design using solid-state devices. Topics include negative resistance oscillators, amplifiers, detectors and mixers, microwave control circuits, frequency converters, and an introduction to CAD. A student should have the basic knowledge to undertake MMIC design. *Prereq.* ECE 3341.

ECE 3614 Solid-State Microwave Circuits A 2 QH
Fall Quarter

ECE 3614 and ECE 3615 cover the same material with the same prerequisites as ECE 3613, but in two 2 QH courses.

ECE 3615 Solid-State Microwave Circuits B 2 QH
Continuation of ECE 3614. *Prereq.* ECE 3614.**ECE 3616 Active Network Synthesis and Design** 4 QH
Fall Quarter, As Announced

Develops multiloop feedback techniques as applied to integrated circuit designs such as three-stage op-amp realizations and minimum sensitivity amplifiers. Analyzes application of these circuits in continuous-time and switched capacitor filters. Develops single-active biquadratic filter sections of Sallen and Key and Friend-Delyannis. Discusses multiloop and multiple-active element realizations such as the generalized impedance converter (GIC), frequency-dependent negative resistance (FDNR), follow-the-leader (FTL) and leap-frog (LF) structures. Considers sensitivity, yield factors, gain-bandwidth product, and the approximation problem. Develops MOS switched-capacitor realizations of basic filter structures. *Prereq.* ECE 3331.

ECE 3617 Active Network Synthesis and Design A 2 QH
Fall Quarter, As Announced

ECE 3617 and ECE 3618 cover the same material with the same prerequisites as ECE 3616, but in two 2 QH courses.

ECE 3618 Active Network Synthesis and Design B 2 QH
Winter Quarter, As Announced

Continues ECE 3617. *Prereq.* ECE 3617.

ECE 3619 Network Synthesis 4 QH
Fall Quarter, As Announced

Explores matrix circuit analysis including m-port parameter systems, positive-real functions, and energy functions. Examines driving-point synthesis techniques for LC, RC, and RL networks and driving-point synthesis of RLC networks. Other topics include properties of two-port networks, two-port synthesis, including the parallel ladder realization, and lattice synthesis. *Prereq.* BSEE or ECE 3100 and ECE 3101.

ECE 3620 Network Synthesis A 2 QH
Winter Quarter, As Announced

ECE 3620 and ECE 3621 cover the same material with the same prerequisites as ECE 3619, but in two 2 QH courses. *Prereq.* ECE 3100 and ECE 3101.

ECE 3621 Network Synthesis B 2 QH
Spring Quarter, As Announced

Continues ECE 3620. *Prereq.* ECE 3620.

ECE 3622 Special Topics in Electronics—Analog MOS LSI Circuits 2 QH
Spring Quarter

Covers selected topics of practical importance in the design of analog MOS integrated circuits. Topics include NMOS and CMOS technology and devices, MOS transistor analog switch, digital analog converters, comparators, analog digital converters, sampled

analog filtering concepts, switched and capacitor filters. *Prereq.* ECE 3331 and ECE 3384.

ECE 3623 Gate Array Design 4 QH
Fall Quarter

Discusses the design, simulation, verification, and implementation of a CMOS gate array. Describes the VAX-based gate array design and logic simulator tools. Provides design examples of digital logic circuits that will be entered, verified, and simulated. Introduces the GE CMOS Macrocell Circuit Library and TEGAS Logic Simulator. After the completion of this course, the GE Microelectronics Center, at Research Triangle Park, North Carolina, will fabricate the chosen student gate array design projects that can then be tested and evaluated. *Prereq.* ECE 3331.

ECE 3624 Gate Array Design A 2 QH
Winter Quarter

ECE 3624 and ECE 3625 cover the same material with the same prerequisites as ECE 3623, but in two 2 QH courses.

ECE 3625 Gate Array Design B 2 QH
Spring Quarter

Continues ECE 3624. *Prereq.* ECE 3624.

ECE 3626 Integrated Circuits Fabrication Processes 1 4 QH
Winter Quarter

Presents an overview of, and the principles underlying, the basic techniques and processes employed in the fabrication of modern integrated circuits. Topics include crystal growth and epitaxy, oxidation deposition, diffusion and ion implementation, and metallization. Discusses how these processes are combined to yield the current technologies (bipolar, NMOS, CMOS, MESFET). *Prereq.* ECE 3384.

ECE 3627 Integrated Circuits Fabrication Processes 1-A 2 QH
Winter Quarter

ECE 3627 and ECE 3628 cover the same material with the same prerequisites as ECE 3626, but in two 2 QH courses. *Prereq.* ECE 3384.

ECE 3628 Integrated Circuits Fabrication Processes 1-B 2 QH
Spring Quarter

Continues ECE 3627. *Prereq.* ECE 3627.

ECE 3629 Integrated Circuit Fabrication Processes 2 4 QH
Fall Quarter, As Announced

Provides an understanding of the state of the art microelectronic fabrication techniques. Advanced topics include electron beam, ion beam and X-ray lithographic techniques as well as dry processes that include plasma etching, ion beam processes, and reactive ion etching. Discusses the concept of gas and plasma kinetics, as well as mechanisms of sputtering and plasma etching. Covers future device development and processing requirements. *Prereq.* ECE 3626.

ECE 3630 Integrated Circuit Fabrication Processes 2-A Fall Quarter, As Announced ECE 3630 and ECE 3631 cover the same material with the same prerequisites as ECE 3629, but in two 2 QH courses. <i>Prereq.</i> ECE 3626.	2 QH
ECE 3631 Integrated Circuit Fabrication Processes 2-B Winter Quarter, As Announced Continues ECE 3630. <i>Prereq.</i> ECE 3630.	2 QH
ECE 3632 Design and Analysis of Digital Integrated Circuits Winter Quarter, As Announced Discusses the analysis and design of basic digital-integrated-circuit logic families. Examines bipolar circuits, including the advanced-Schottky TTL, emitter-coupled logic. Explores double-buffered CMOS and NMOS logic gates, including dynamic logic circuits such as domino logic memory cells and basic cells in logic arrays. Reviews design considerations such as propagation delay, switching speed, fan-out, and the effect of parasitics. Correlates design techniques with computer simulations. <i>Prereq.</i> ECE 3101 or equiv.	4 QH
ECE 3633 Design and Analysis of Digital Integrated Circuits A Winter Quarter, As Announced ECE 3633 and ECE 3634 cover the same material with the same prerequisites as ECE 3632, but in two 2 QH courses. <i>Prereq.</i> ECE 3101 or equiv.	2 QH
ECE 3634 Design and Analysis of Digital Integrated Circuits B Spring Quarter, As Announced Continues ECE 3633. <i>Prereq.</i> ECE 3633.	2 QH
ECE 3635 Antennas and Radiation Spring Quarter Focuses on fundamental properties of antennas; linear and aperture antennas including slot, horn, and patch antennas; arrays; receiving antennas; and numerical methods in antenna analysis. Topics include radiowave propagation; antennas over plane and spherical earth; interference, diffraction, surface waves, and ducting; scattering from terrain surfaces; and other propagation topics as time permits. <i>Prereq.</i> ECE 3341 and ECE 3344.	4 QH
ECE 3636 Antennas and Radiation A Fall Quarter ECE 3636 and ECE 3637 cover the same material with the same prerequisites as ECE 3635, but in two 2 QH courses. <i>Prereq.</i> 3341 and ECE 3344.	2 QH
ECE 3637 Antennas and Radiation B Winter Quarter Continues ECE 3636. <i>Prereq.</i> ECE 3636.	2 QH
ECE 3638 Microwave Electron Devices Fall Quarter Presents the fundamental principles and operation of the major conventional (linear-beam and crossed-field) and novel (maser effect) devices. Examines interactions of non-relativistic and	4 QH

relativistic electron beams with electromagnetic fields; linear-beam tubes (klystron, traveling wave tube, backward-wave amplifier and oscillator, etc.); crossed-field tubes (magnetron, forward and backward cross-field amplifier, high-gain CFA, etc.); and maser-effect devices (cyclotron maser, gyrotron). *Prereq.* ECE 3341.

ECE 3639 Microwave Electron Devices A **2 QH**
Winter Quarter
ECE 3639 and ECE 3640 cover the same material with the same prerequisites as ECE 3638, but in two 2 QH courses. *Prereq.* ECE 3341.

ECE 3640 Microwave Electron Devices B **2 QH**
Continues ECE 3639. *Prereq.* ECE 3639.

ECE 3641 Microwave Solid-State Devices **4 QH**
Winter Quarter
Covers the principles of microwave solid-state devices. Passive devices include varactor diodes and their applications in parametric amplifiers, with a discussion of the Manley-Rowe relations, varistors, p-i-n diodes and step recovery diodes. Also covers active two-terminal devices. Discusses the Ridley-Watkins-Hilsum-Gunn effect, followed by its application in transferred electron devices with a description of the different modes of operation. Considers the theory of avalanching and the principle of operation of the Read diode, including a detailed description of IMPATT, TRAPATT, BARRITT, and DOVETT devices and their applications in oscillator and amplifier circuits. Describes microwave operation of bipolar and FET devices including the HBT, MESFET, and HEMT: the small-signal equivalent circuit model, figures of merit, and noise figure analysis. Provides an understanding of microwave solid-state devices and their applications. *Prereq.* ECE 3384 or permission of instructor.

ECE 3644 Passive Microwave Circuits **4 QH**
Fall Quarter
Covers the characteristics of passive circuits with particular emphasis on planar circuits, since these have become significant with the development of MMIC technology. Investigates S parameter theory, fundamental to all microwave circuit analysis. Develops the characteristics of planar transmission lines, discontinuities, and lumped circuits. Examines dielectric and YIG resonators in detail, as well as impedance matching. Defines hybrids and couplers, which are important in all microwave circuits, and covers the corresponding applications. Describes microwave filters and multiplexers. Provides an understanding of passive microwave circuits.

ECE 3797 Engineer Degree Continuation **0 QH**
Any Quarter
Candidates sign up for thesis continuation if their thesis is not completed after they have registered for three consecutive quarters or 10 QH of EE degree thesis. Continuous registration is required until the candidate graduates.

ECE 3798 Master's Thesis Continuation Any Quarter	0 QH
ECE 3799 Doctoral Dissertation Continuation Any Quarter	0 QH
ECE 3860 Master's Thesis Any Quarter	8 QH
Offers analytical and/or experimental work conducted under the auspices of the department. <i>Prereq. BS degree in engineering or science.</i>	
ECE 3861 Master's Thesis Any Quarter	4 QH
ECE 3862 Master's Thesis Any Quarter	2 QH
ECE 3870 Engineer Degree Thesis Any Quarter	8 QH
Offers analytical and/or experimental work conducted under the auspices of the department. Minimum of 4 QH, maximum of 8 QH allowed per quarter. <i>Prereq. Admission to Engineering Degree Program.</i>	
ECE 3871 Engineer Degree Thesis Any Quarter	4 QH
ECE 3872 Engineer Degree Thesis Any Quarter	2 QH
ECE 3880 Doctoral Thesis Any Quarter	0 QH
Offers theoretical and/or experimental work conducted under the auspices of the department. <i>Prereq. Passing of PhD qualifying exam.</i>	
ECE 3887 Master's Seminar 1 Any Quarter	2 QH
Involves a library survey of a selected topic in the general field of electrical engineering with an oral presentation based on this survey. Requires participation in	

the departmental seminar program of guest lectures. *Prereq. BS degree in engineering or science.*

ECE 3888 Master's Seminar 2 Any Quarter	2 QH
Requires the preparation of a research paper suitable for publication in a professional journal, plus an oral presentation of this report. <i>Prereq. ECE 3887.</i>	
ECE 3889 Doctoral Seminar Any Quarter	0 QH
Requires presentation of a seminar to the electrical engineering department on a subject related to a PhD thesis. The thesis supervisor will coordinate the seminar. <i>Prereq. Passing of PhD qualifying exam.</i>	
ECE 3892 Doctoral Reading Any Quarter	0 QH
Includes only material approved by the candidate's adviser. <i>Only S or F grades will be assigned for this course. Prereq. Passing of PhD qualifying exam.</i>	
ECE 3893 Special Problems in Electrical Engineering Any Quarter	2 QH
Offers theoretical or experimental work under individual faculty supervision. ECE 3896 is the 4 QH equivalent of ECE 3893. <i>Prereq. Permission of department chair.</i>	
ECE 3894 Engineer Degree Reading	4 QH
Taken upon completion of 30 QH of satisfactory course work. No credits toward course requirements are given. <i>Minimum of 4 QH, maximum of 8 QH allowed per quarter.</i>	
ECE 3895 Engineer Degree Reading Any Quarter	8 QH
ECE 3896 Special Problems in Electrical Engineering Any Quarter	4 QH

Biomedical Engineering

INT 3250 Engineering and Medicine 1 Fall Quarter	2 QH
Discusses the intersection of technology with medicine, historical development of bioengineering profession, and its impact on society. Studies activities embraced by the profession today, including educational, training, and career opportunities in clinical, biomedical, and medical engineering for individuals at the BS, MS, and PhD levels. Examines future goals of engineering in biology and medicine, and issues basic to the relationship between new medical technology and the efficiency and effectiveness of the health care system. <i>Prereq. Permission of instructor.</i>	
INT 3251 Biomedical Applications of Heat and Mass Transfer Winter Quarter	2 QH
Studies bioheat equation, thermal transport in living systems, thermal properties, and thermal techniques	

in the measurement of blood flow. Presents applications of heat transfer in medicine including hyperthermia for cancer therapy, hypothermia for tissue and organ preservation and cryosurgery, thermal sources for implantable artificial heart, and thermography in cancer detection. *Prereq. Permission of instructor.*

INT 3252 Selected Topics in Bioengineering Spring Quarter	2 QH
Explores biomedical engineering topics selected from fields of biomaterials, nuclear medicine, radiation diagnosis and therapy, biological transport processes, artificial organs, rehabilitation engineering, and microprocessor based clinical instruments. Introduces medical technology assessment. <i>Prereq. INT 3250 or permission of instructor.</i>	

Industrial Engineering

Each course description includes information on the quarter in which classes are usually offered. The quarters listed are presented for planning; however, the Graduate School of Engineering cannot guarantee that all courses will be offered. Students must refer to the Graduate School of Engineering Quarterly Course Offering sheets to determine what courses are actually offered in any given quarter.

IIS 3100 Basic Engineering Economy 2 QH Fall and Winter Quarters

Presents economic analysis in formulating business policies and selecting alternatives from possible engineering solutions to industrial problems, present worth, annual cost, and rate of return techniques using discrete compound interest calculations. *Prereq.* Admission to graduate program.

IIS 3101 Industrial Accounting for Engineers 2 QH Fall and Winter Quarters

Introduces basic accounting principles and procedures, including use of accounting data as a management tool. Covers basic cost accounting procedures related to materials, labor, and manufacturing expense cost control. Topics include job order, process, and standard cost systems. *Prereq.* Admission to graduate program.

IIS 3102 Introduction to Human Factors Engineering 2 QH Fall Quarter

Surveys the principal topics and areas of concentration in the field. Introduces sensory physiology and sensory performance; basic motor capabilities and limitations; concepts of the human as a processor of information; and methods of gathering human performance data. Normally the first course in the human factors areas for students without behavioral science background. *Prereq.* IIS 3113 or permission of instructor.

IIS 3103 Basic Operations Research 4 QH Winter and Spring Quarters

Introduces the theory and use of deterministic and stochastic models to represent industrial operations. Discusses models of linear programming, dynamic programming, inventory control, waiting lines, and Markov Chains. *Prereq.* IIS 3113.

IIS 3110 Pascal for Information Systems 4 QH Fall, Winter, and Spring Quarters

Introduces the Pascal programming language. Topics include algorithms and structured programming, primitive data types, control constructs, subprograms, compound data types (arrays, records), recursion, abstract datatypes, input/output processing, pointers, and object-oriented programming. *Prereq.* Admission to graduate program.

IIS 3111 Principles of COBOL 2 QH Fall Quarter

Presents fundamentals of computer programming in COBOL. Topics include elementary computer functioning, program organization, input/output operations, arithmetic and data-handling verbs, and program logic development through the use of flow charts. Introduces storage and manipulation of large

data files on magnetic tape. No prior computer experience is required. *Prereq.* Admission to graduate program.

IIS 3113 Basic Probability and Statistics 4 QH Fall and Winter Quarters

Offers fundamental concepts of probability. Presents events, sample space, discrete and continuous random variables. Discusses density functions, mass functions, cumulative probability distributions, and moment generating functions. Explores expectation of random variables, as well as common discrete and continuous probability distributions including binomial, poisson, geometric, uniform, exponential, and normal. Topics also include multivariate probability distributions, covariance and independence of random variables, sampling and descriptive statistics, parameter estimation, confidence intervals, and hypothesis testing. *Prereq.* Admission to graduate program.

IIS 3116 Assembly Language 4 QH Fall, Winter, and Spring Quarters

Studies assembly language programming, emphasizing understanding computer organization. Considers instruction types, formats, and addressing modes in detail at both the symbolic and machine levels. Explores register organization, binary data and number of representations, and two's complement arithmetic. Students write and debug many assembly language programs, which provides an understanding of structured programming constructs, data structure organization, passing parameters on the stack, macros, instruction timing, interrupt handling, interfacing with devices, system utilities, and higher-level languages. Possible computers include Motorola 6800, Intel 80386-based machines, or the VAX. *Prereq.* Higher-level language.

IIS 3204 Engineering/Organizational Psychology 4 QH Fall and Spring Quarters

Analyzes the purpose and functioning of organizations as the basic networks for achieving goals through coordination of effort, communication, and responsibility. Emphasizes the role and function of engineering organizations based on modern behavioral science concepts. Covers the application of psychology to industry relative to human relations, group dynamics, tests and measurements, personnel practices, training, and motivation. *Prereq.* Admission to graduate program.

IIS 3205 Industrial Organizations 2 QH Winter Quarter

IIS 3205 and IIS 3206 cover the same material as IIS 3204, but in two 2 QH courses.

IIS 3206 Industrial Psychology for Engineers 2 QH
Spring QuarterContinues IIS 3205. *Prereq.* IIS 3205.**IIS 3207 Financial Management for Engineers** 4 QH
Winter and Spring QuartersStudies the issues and processes of short-term financing on industrial firms. Offers financial analysis of cases, supplemented by readings to develop familiarity with sources and uses of working capital as well as the goals and problems involved in its management. Covers the analysis necessary for such long-term financial decisions as issuance of stock or bonds; contracting of leases or loans, and financing of a new enterprise; mergers, capital budgeting, the cost of capital, and the valuation of a business. *Prereq.* IIS 3101.**IIS 3216 Advanced Engineering Economy** 2 QH
Winter QuarterEmphasizes the practical application of the techniques studied in basic engineering economy. Explores the problems of implementation through class discussion of cases and student projects, as well as recent advances in the techniques of engineering economy, especially those relating to the consideration of uncertainties. *Prereq.* IIS 3100.**IIS 3217 Engineering Project Management** 4 QH
Fall, Winter, and Spring QuartersStudies the optimization of schedules utilizing pertinent software tools such as the linear programming and project management packages. Examines other graphics software used to draw project diagrams such as Gantt charts, PERT diagrams, manpower loading charts, and funding charts. Considers determination of the critical path and comparison of actual performance with the planned schedule, and discusses the systems life cycle. Addresses needs analysis, requirements definition, preliminary design, detailed design, and implementation in the context of project management. *Prereq.* Admission to graduate program.**IIS 3218 Planning and Managing Information Systems Development** 4 QH
Winter QuarterConsiders the computer system development life cycle, and interactions between the system and the organization. Discusses design parameters and tradeoffs, planning for externalities, and individual and organizational aspects of human decision making. Explores the systems approach to planning, management, and control of effective information systems development. Based on extensive use of case studies and includes some guest speakers. *Prereq.* IIS 3615.**IIS 3304 Production Analysis** 4 QH
Fall Quarter

Presents modern quantitative techniques of production planning and control considering deterministic and probabilistic models. Topics include project planning, forecasting, aggregate planning and master scheduling, inventory analysis and control, materials

requirement planning, job shop scheduling, and dispatching problems. *Prereq.* IIS 3103 and IIS 3113.**IIS 3307 Introduction to Microprocessors** 2 QH
Winter QuarterIntroduces advanced microprocessor systems, including the basic concepts of system architecture, interfaces, and programming using modern 16- and 32-bit microprocessor families. Discusses CPU programming model, instruction set, addressing modes, and exception processing. Topics covered include privilege states, memory management, bus control, principles of assembly language programming, and two microprocessor families: MC 68000 and iAPX 86. *Prereq.* Structured higher-level language.**IIS 3308 Microcomputer Applications** 2 QH
Spring QuarterIntroduces microcomputer applications in local networks. Focuses on multi-microcomputer systems, bus topology interconnection, communication architecture, and protocols. Examines examples of microcomputer-based local network nodes, local network model, and protocol development. Discusses token bus and collision detection protocols. *Prereq.* Structured higher-level language and IIS 3307 or equiv.**IIS 3309 Computer Methods in Manufacturing** 4 QH
Spring QuarterInvestigates the use of computers in the system design and implementation of Computer Integrated Manufacturing (CIM). Topics may include the ICAM definition language for modeling process, MRP, project management, manufacturing simulation and facility layout, CAD/CAM, database interface, and other important application of computers to manufacturing systems. *Prereq.* IIS 3311, IIS 3503, or by permission of instructor.**IIS 3310 Manufacturing Methods and Processes** 4 QH
Fall QuarterExplores the structures of polymers (thermoplastic, thermosetting, and glasses) and the manufacturing processes for polymers including thermoforming. Presents the structure of metals and the manufacturing processes for metal forming. Includes a discussion of alloys and welding and brazing. *Prereq.* BS degree in engineering or science.**IIS 3311 Computer-Aided Manufacturing** 4 QH
Winter QuarterProvides an overview of computer-aided manufacturing. Covers the areas that encompass the term CAM: group technology, material requirements planning, part coding and classification, numerical control, part programming, and management systems. Broad coverage of each of the areas is given to allow the student to gain an appreciation of the automated factory. *Prereq.* Higher-level language.**IIS 3312 Forecasting and Inventory Control** 4 QH
Winter Quarter

Examines econometric methods of forecasting the demand for industrial products and emphasizes techniques applicable to individual companies and the total demand. Uses mathematical model of the causal

factors with special attention to determining the reliability of the model. Studies the design and operation of inventory systems from a scientific management point of view, including both required theory and practical aspects. Subjects include inventory control models and techniques, production planning, and control models and methods. *Prereq.* IIS 3103 and IIS 3523.

IIS 3400 Human Factors Engineering 4 QH
Spring Quarter, Odd Years

Covers sensory motor and work environment considerations. Topics include the design of equipment and systems for human use, with the application of engineering psychology; visual and auditory presentation of information; human information processing and skilled task performance. Examines the human as a work-performing, heat-generating physiological engine, and the implied restrictions on the equipment and workplace to provide occupational safety and effective human/machine performance. *Prereq.* IIS 3102.

IIS 3406 Man/Computer Interaction 2 QH
Spring Quarter

Examines the design and evaluation of the human/computer interface in on-line information systems. Discusses formatting of visual displays and auditory outputs, techniques to facilitate operator inputs, pacing and control of the interactive sequence, operator training, task analysis, and performance testing. Student projects in areas of novel application. *Prereq.* IIS 3102.

IIS 3503 Simulation Methodology and Applications 4 QH
Fall and Spring Quarters

Discusses when, where, and how to use discrete event simulation techniques. Topics include model design, development, and validation; tactical and strategic planning considerations in the use of the model; input data reduction; alternative programming languages for implementing models; efficiency in running simulations, and statistical reliability in the design and analysis of simulation experiments. Considers special purpose simulation languages, such as SIMSCRIPT, GPSS, and SIMAN. Provides the opportunity to code models in one language. *Prereq.* IIS 3523 and higher-level language.

IIS 3509 Design of Experiments 4 QH
Fall Quarter

Examines the theory and application of experimental design techniques such as modeling and statistics that can optimize resources and improve decision making risks. Covers experiments with single and multiple factors of interest and those with high-order experimental restrictions. Some additional analyses techniques will also be covered. *Prereq.* IIS 3523.

IIS 3512 Stochastic Modeling and Queuing Systems 2 QH
Spring Quarter

Develops the probability techniques necessary for the study of queues, Poisson process, and semi-Markov and Markov process. Analyzes the behavior of queueing systems, single and multiple queues, queues with

general arrival and general server, and queues with priority. *Prereq.* IIS 3113.

IIS 3513 Network Analysis and Advanced Linear Programming 4 QH

Examines concepts of network analysis and advanced linear programming. Topics include spanning trees, path and flow algorithms, matchings and coverings, postman and traveling salesman problems, location problems, revised simplex and polynomial bounded algorithms, parametric programming, and concepts of upper bounding and decomposition. *Prereq.* IIS 3103.

IIS 3514 Advanced Operations Research 4 QH
Fall and Winter Quarters

Studies important families of mathematical programming problems and optimization methods. Examines generalized networks including the transshipment, shortest route, maximal flow, and the minimal spanning tree problems. Presents the cutting plane and the branch and bound algorithm for binary and mixed integer programming problems. Introduces nonlinear programming including unconstrained optimization, the Kuhn-Tucker conditions, gradient methods, separable, quadratic, and geometric programming. *Prereq.* IIS 3103.

IIS 3516 Statistical Quality Control 4 QH
Fall Quarter, Odd Years

Studies the fundamental concepts of quality planning and improvements. Covers analysis and application of modern statistical process control methods, inspection error, and design of sampling plans. Covers software quality assurance and examines the concepts of Deming, Ishikawa, Feigenbum, and Taguchi's approach in quality planning, organization, and improvement. *Prereq.* IIS 3113.

IIS 3522 Systems Engineering Design and Analysis 4 QH
Spring Quarter

Covers principles of systems modeling and analysis using continuous simulation techniques. Topics include differential equations as system models; Laplace transformations; numerical approximation techniques; stability; steady-state error; control actions; alternative modeling scheme; and validation of system models via continuous simulation techniques. *Prereq.* Admission to graduate school and higher-level language.

IIS 3523 Applied Statistics 4 QH
Winter and Spring Quarters

Develops statistical models for analysis and prediction of random phenomena. Topics include descriptive statistics and hypothesis testing; linear models, both regression and ANOVA; and chi-squared and non-parametric tests. Introduces design of experiments. Emphasizes applying linear models in real-life situations. *Prereq.* IIS 3113.

IIS 3524 Multi-Criteria Decision Making 4 QH
Fall Quarter, Even Years

Covers theory, computation and applications of multi-criteria decision making. Topics include techniques for generating noninferior solutions, techniques for

finding the best-compromise solution, multiattribute utility functions, goal programming, and multiple decision-maker methods. *Prereq.* IIS 3103.

IIS 3525 Introduction to Reliability Analysis and Risk Assessment 4 QH
Fall Quarter, Odd Years

Introduces probability theory, classical and Bayesian statistics useful for reliability analysis of large, and complex systems. Covers Bayesian probability encoding of experience data, principles of the methods of risk assessment, and reliability analysis including fault trees, decision trees, and reliability block diagrams. Examines practical applications to industrial operations: for example, nuclear and chemical plants, military systems, and large processing plants. *Prereq.* IIS 3113 or permission of instructor.

IIS 3526 Advanced Reliability Analysis, Risk Assessment, and Maintenance 4 QH
Spring Quarter, Odd Years

Considers extended application and use of reliability and probabilistic risk analysis methods. Explores methods for common cause/dependent failure analysis, human reliability analysis, and treatment of uncertainties. Examines Bayesian statistics applied to data analysis and discrete probability distribution (DPD) arithmetic for propagation of uncertainty. Studies time-dependent reliability analysis; Markov models, availability, and maintenance theory. Discusses replacement and maintenance strategy development. Explores the role of maintenance in improving systems reliability, performance, and productivity, including the Deming method of quality control. Follows case studies in industrial system. *Prereq.* IIS 3525.

IIS 3535 Reliability Engineering and Testing 4 QH
Spring Quarter, Even Years

Introduces the evolving methodology of reliability as a design parameter. Studies the problems of quantifying, assessing, and verifying reliability. Presents various factors that determine the stress and strength of components and their impact on system reliability. Topics include practical applications, examples, and problems in a range of engineering fields, such as mechanical, electrical, industrial, computer structures, and automatic control systems. *Prereq.* IIS 3113.

IIS 3540 Total Quality Control for Engineering As Announced 4 QH

Studies principles of Total Quality Control (TQC). Examines Japanese management methods for technologies: manufacturing, electrical, steel and automobile industries. Covers seven statistical methods of TQC: histograms, cause and effect diagrams, check sheets, Pareto diagrams, graphs, control charts, and scatter diagrams. Uses case studies of TQC implementation in technology management with guest lectures by invited authorities. *Prereq.* IIS 3113.

IIS 3601 Compiler Design 4 QH
Winter Quarter

Introduces the principles and techniques used in writing compilers. Topics include lexical analysis, parsing, semantic analysis, code generation, and symbol table management. Assigns projects and homework in the C language. *Prereq.* C language programming experience.

IIS 3604 Data Structures 4 QH
Fall, Winter, and Spring Quarters

Introduces basic concepts of data structures. Topics include arrays, stacks, lists, linked lists, queues, trees, graphs, symbol tables, and files. Presents an abstract data type for each data structure and discusses various implementations in a high-level language. Analyzes algorithms for handling data and shows applications of particular structures in order to emphasize the role of abstraction in problem solving with computers. Covers searching and sorting techniques. *Prereq.* IIS 3110.

IIS 3607 Operating Systems and Systems Software 4 QH
Fall, Winter, and Spring Quarters

Explores the underlying algorithms and policies that influence developing and executing modern operating systems. Considers operating systems facilities that assist the design and implementation of application programs. Topics include process concurrency, synchronization, deadlock, multiprogramming, virtual memory, process scheduling, security, and protection. Uses the UNIX operating system as a model with several programming assignments using UNIX system calls. *Prereq.* C or Pascal and IIS 3604 and IIS 3610.

IIS 3610 Computer Architecture 4 QH
Fall, Winter, and Spring Quarters

Investigates fundamental concepts in computer architecture and organization. Topics include the history and evolution of computers; digital logic, gating, timing diagrams, and control signals; interconnection structures such as buses and data paths; data storage devices, interfaces, and organization; I/O devices and technology; interrupts and DMA; and cache and paging. Emphasizes CPU architecture, including binary arithmetic and organization of the ALU, instruction types, formats, addressing modes, and pipelining. Considers microprogramming of the CPU's control unit in detail, and surveys RISC architectures. *Prereq.* IIS 3116.

IIS 3615 Analysis and Design of Computer Information Systems 4 QH
Fall Quarter

Introduces software engineering analysis and design techniques and computer technology. Topics include techniques for determining information requirements for MIS/DSSs, development of the functional systems design, and computer system design considerations such as the CPU, main memory, operating systems functions, computer languages, input devices, secondary memory, file organization, database management systems, data communications, data security, and output and display devices. Aims to provide

capability in the skeletal design of a computer system to support a given set of information requirements. *Prereq.* Admission to graduate program.

IIS 3621 Information Systems and Society 2 QH
Fall Quarter

Analyzes the role computer systems play in modern society. Contrasts the beneficial use of computers in commercial and industrial enterprises with the potential for infringement of individual privacy rights. Discusses sufficient technical material on computer hardware, software, and data communications to permit assessment of system feasibility and reviews relevant major legislation that affects the use of computer systems. *Prereq.* Admission to graduate program.

IIS 3622 Information Systems in a Microcomputer Environment 4 QH

Winter and Spring Quarters

Explores the role of microcomputers in providing decision support information, using the IBM PC, or compatible machine as a representative microcomputer. Provides detailed examination of the aspects of microcomputer architecture essential to the understanding of this contribution. Topics include PC architecture, PC operating system, the use of interrupts, data communications, and approaches to the rational design and selection of software for PCs. Assignments using the PCs develop insight into the operation of the PC at its lowest level, allowing the student to experience and evaluate generic categories of PC software. *Prereq.* IIS 3615.

IIS 3623 File Processing 2 QH
Fall Quarter

Studies the processing of sequential, indexed-sequential, and direct/relative data files on tape and disk. Considers record blocking, searching, sorting, and merging operations, and random access techniques. Introduces database management concepts, and if time permits, RPG. *Prereq.* Knowledge of COBOL programming or IIS 3111.

IIS 3624 Software Engineering 4 QH
Winter and Spring Quarters

Studies the software life cycle (requirements analysis and specification, software design, coding, testing, and maintenance), including verification, validation, and documentation at various stages of the life cycle. Covers structured analysis and object-oriented design methodologies. Surveys user interface design, prototyping, CASE tools, software metrics, and software development environments. Emphasizes modular software construction and development of modular libraries. Course requirements include a small software development project. *Prereq.* IIS 3637.

IIS 3626 Networks and Telecommunications 4 QH
Spring Quarter

Studies network goals and applications, including architecture, topologies, and protocols. Considers layered communications protocol design, such as layer functions, interlayer interfaces, and peer processes. Topics include performance measures, data

communication techniques, wide area and local networks, channel interfaces and access schemes, workstations and server nodes, distributed systems, and internetworking. *Prereq.* IIS 3610.

IIS 3628 Database Management Systems 4 QH
Fall and Spring Quarters

Examines fundamental concepts and design of database management systems (DBMS). Topics include the role of DBMS in organizations; alternative database models (hierarchical, network and relational); underlying data structures for each database model; example DBMS for each model type; design of an information system using a DBMS approach; and practical experience with at least one DBMS on a micro- or minicomputer, such as RBase 5000 or Data-Trieve. *Prereq.* IIS 3604.

IIS 3629 Expert Systems in Engineering 4 QH
Spring Quarter

Introduces students to the theory, topics, and applications of expert systems in engineering. Topics include knowledge representation (semantic networks, frames, production rules, logic systems), problem-solving methods (heuristic search algorithms, forward and backward chaining, constraint handling, truth maintenance), approximate reasoning methods (Bayesian, Dempster-Shafer, fuzzy logic, certainty factors), expert system project management and knowledge engineering, and expert system shells. Development of an expert system for engineering using an expert system shell is part of the course requirements. *Prereq.* Admission to graduate program.

IIS 3630 Machine Intelligence 4 QH
Fall Quarter

Examines intelligent computer systems that exhibit behavior normally attributed to humans: solving problems, reasoning, learning, and handling collections of expert knowledge. Focuses on methods, techniques, and implementations of computer systems for problem solving in engineering. Topics include an overview of the field of artificial intelligence (AI), one of the AI programming languages (LISP or Prolog), knowledge representation formalisms and their implementations, search strategies and algorithms, planning, logic and theorem proving, constraint handling and truth maintenance systems, reasoning with uncertainty and heuristics, qualitative reasoning, and applications of artificial intelligence in engineering. *Prereq.* IIS 3604.

IIS 3631 Machine Learning 4 QH
As Announced

Introduces the problem of developing programs that can learn (that is, increment their knowledge in the process of execution). Covers basic principles, techniques, tools, and algorithms for building learning systems. Concentrates on the use of learning algorithms in software rather than on the human learning mechanisms. Discusses classification of machine learning methodology, algorithms, and programs, as well as current machine learning research being conducted throughout the world. *Prereq.* IIS 3630 or equiv.

IIS 3632 C/UNIX for Information Systems Spring Quarter Covers both the fundamentals of programming in C and using the Unix operating system. C topics include C operators and precedence, functions, C structures and data structures, and program control statements. Unix topics include basic Unix commands, pipes, filters, Unix file system, and shell programming. Major course project is an information system coded in C. <i>Prereq.</i> IIS 3110 or equiv.	4 QH	IIS 3804 Special Topics Any Quarter Offers special topics in IE and IS. <i>Prereq.</i> <i>Permission of instructor.</i>	4 QH
IIS 3637 Programming Languages for Software Engineering Fall, Winter, and Spring Quarters Introduces programming languages through available procedural languages and the principles of their design and implementation. Surveys languages historically and provides insight into aspects of programming languages such as control structures, parameter passing conventions, run-time structures, and binding time. Provides exposure to modern representative languages, including limited hands-on experience with block-structure languages, object-oriented languages, and languages for list processing and logic programming. <i>Prereq.</i> IIS 3604.	4 QH	IIS 3805 Special Topics Any Quarter Offers special topics in IE and IS. <i>Prereq.</i> <i>Permission of instructor.</i>	2 QH
IIS 3651 Software Engineering Project Spring Quarter Offers teamwork under faculty supervision on a large software project. The projects are drawn from an engineering field, such as design, systems engineering, manufacturing, planning maintenance, reliability, quality control, risk assessment, project control, or evaluation of alternatives. The project may cover either the whole software development life cycle or a significant part of it. <i>Prereq.</i> IIS 3624 or permission of instructor.	8 QH	IIS 3806 Seminar in Industrial Engineering Any Quarter Involves presentations of thesis-related topics by students, as well as presentations and discussions by faculty and eminent people in the field on timely industrial engineering topics. Includes field trips and visitations where appropriate. <i>Prereq.</i> <i>Permission of instructor.</i>	2 QH
IIS 3652 Software Engineering Project 1 Spring Quarter IIS 3652 and IIS 3653 cover the same material as IIS 3651, but in two 4 QH courses.	4 QH	IIS 3840 Master's Thesis in Engineering Software Design Any Quarter Offers analytical and/or experimental work in engineering software design conducted under the auspices of the faculty adviser. <i>Prereq.</i> <i>Consent of adviser.</i>	8 QH
IIS 3653 Software Engineering Project 2 Spring Quarter IIS 3652 and IIS 3653 cover the same material as IIS 3651, but in two 4 QH courses.	4 QH	IIS 3841 Master's Thesis in Engineering Software Design Any Quarter Offers analytical and/or experimental work in engineering software design conducted under the auspices of the faculty adviser. <i>Prereq.</i> <i>Consent of adviser.</i>	4 QH
IIS 3797 Engineer Degree Continuation Any Quarter	0 QH	IIS 3842 Master's Thesis in Engineering Software Design Any Quarter Offers analytical and/or experimental work in engineering software design conducted under the auspices of the faculty adviser. <i>Prereq.</i> <i>Consent of adviser.</i>	2 QH
IIS 3798 Master's Thesis Continuation Any Quarter	0 QH	IIS 3850 IE Master's Degree Project Any Quarter <i>Prereq.</i> <i>Consent of adviser.</i>	4 QH
IIS 3799 Doctoral Dissertation Continuation Any Quarter	0 QH	IIS 3860 Master's Thesis Any Quarter Offers analytical and/or experimental work conducted under the auspices of the department. <i>Prereq.</i> <i>Consent of adviser.</i>	8 QH
IIS 3801 Independent Study in Industrial Engineering Any Quarter Offers individual work under faculty supervision. <i>Prereq.</i> <i>Consent of adviser.</i>	2 QH	IIS 3861 Master's Thesis Any Quarter Same as IIS 3860.	4 QH
IIS 3802 Independent Study in Industrial Engineering Any Quarter Same as IIS 3801.	4 QH	IIS 3862 Master's Thesis Any Quarter Same as IIS 3860.	2 QH
		IIS 3870 Industrial Engineer Degree Project Any Quarter Undertaken with the approval of the candidate's adviser and the department graduate committee.	10 QH
		IIS 3873 Industrial Engineer Degree Project Any Quarter Same as IIS 3870.	4 QH

IIS 3874 Industrial Engineer Degree Project
Any Quarter
 Same as IIS 3870.

2 QH

IIS 3885 Doctoral Thesis
Any Quarter

0 QH

Doctoral thesis research conducted under advis-
 er-ship of the doctoral student's dissertation committee.
Prereq. Admission to doctoral candidacy.

Mechanical Engineering

Each course description includes information on the quarter in which classes are usually offered. The quarters listed are presented for planning; however, the Graduate School of Engineering cannot guarantee that all courses will be offered. Students must refer to the Graduate School of Engineering Quarterly Course Offering sheets to determine what courses are actually offered in any given quarter. "Odd" and "even" years refer to the fall quarter of the academic year, for example, spring 1992 of the 1991–1992 academic year, would be an "odd" year.

ME 3100 Mathematical Methods for Mechanical Engineers 4 QH

Fall Quarter

Embodies the material in ME 3101 and ME 3102.
Prereq. Admission to the Graduate School of Engineering.

ME 3103 Mathematical Methods for Mechanical Engineers I 2 QH

As Announced

Presents Bessel and Legendre functions, boundary-value problems and series of orthogonal functions. Discusses partial differential equations and applications to heat transfer, fluid flow, vibrations, and wave propagation. *Prereq. Admission to the Graduate School of Engineering.*

ME 3102 Mathematical Methods for Mechanical Engineers 2 2 QH

As Announced

Considers vector analysis, divergence theorem, functions of a complex variable, Laurent series and singular points, residues and contour integration, and applications. *Prereq. Admission to the Graduate School of Engineering.*

ME 3120 Theory of Elasticity 4 QH

Fall and Winter Quarters

Embodies the material in ME 3121 and ME 3122.
Prereq. Admission to the Graduate School of Engineering.

ME 3121 Theory of Elasticity I 2 QH

As Announced

Analyzes Cartesian tensors using indicial notation. Explores stress and strain concepts, point stress and strain, relation to tensor concepts, and governing equations for the determination of stress and displacement distributions in a solid body. Examines exact solutions of the governing equations for elastic solids. *Prereq. Admission to the Graduate School of Engineering.*

ME 3122 Theory of Elasticity 2 2 QH

As Announced

Considers plane stress and strain problems in rectangular and polar coordinates including thermal stress, and the relation of elasticity theory to strength of materials. Topics include torsion of prismatic and axially

symmetric bars, and the bending of thin flat rectangular and circular plates. *Prereq. ME 3121.*

ME 3140 Advanced Dynamics 4 QH

Winter and Spring Quarters

Embodies the material in ME 3141 and ME 3142.
Prereq. Admission to the Graduate School of Engineering.

ME 3141 Advanced Dynamics I 2 QH

As Announced

Studies kinematics of particles and rigid bodies, modeling and application of fundamental laws of motion, and dynamic response of lumped parameter systems. *Prereq. Admission to the Graduate School of Engineering.*

ME 3142 Advanced Dynamics 2 2 QH

As Announced

Continues ME 3141. Topics include Lagrange's equations, applications in two and three dimensions, and introduction to vibrations. *Prereq. ME 3141.*

ME 3200 General Thermodynamics 4 QH

Winter Quarter

Examines fundamentals of equilibrium thermodynamics. Topics include work, energy, heat, temperature, available energy, entropy, first and second laws of thermodynamics, and simple systems. Covers closed and open systems, availability loss and irreversibility, heat engines, multicomponent systems, mixtures of gases, chemical reactions, and chemical equilibrium. Equivalent to courses ME 3201 and ME 3202. *Prereq. Admission to the Graduate School of Engineering.*

ME 3201 General Thermodynamics I 2 QH

As Announced

ME 3201 and ME 3202 present the same material contained in ME 3200 but in two 2 QH courses. *Prereq. Admission to the Graduate School of Engineering.*

ME 3202 General Thermodynamics 2 2 QH

As Announced

Continues ME 3201. *Prereq. ME 3201.*

ME 3210 Essentials of Fluid Dynamics 4 QH

Fall Quarter

Introduces fluid dynamics as preparation for more advanced courses in the thermofluids curriculum,

providing a strong background in fluid mechanics. Topics may include Cartesian tensors, differential and integral formulation of the equations of conservation of mass, momentum, and energy. Covers molecular and continuum transport phenomena; the Navier-Stokes equations; vorticity; inviscid, incompressible flow, the velocity potential, and Bernoulli's equation; viscous incompressible flow; the stream function; some exact solutions; and energy equation including heat conduction and viscous dissipation. This material is also covered in the two 2 QH courses ME 3211 and ME 3212. *Prereq.* Admission to the Graduate School of Engineering.

ME 3211 Essentials of Fluid Dynamics 1 **2 QH**
As Announced

ME 3211 and ME 3212 present the same material with the same prerequisites as ME 3210, but in two 2 QH courses. *Prereq.* Admission to the Graduate School of Engineering.

ME 3212 Essentials of Fluid Dynamics 2 **2 QH**
As Announced

Continues ME 3211. *Prereq.* ME 3211.

ME 3250 Advanced Physical Metallurgy 1 **2 QH**
As Announced

Examines dislocation theory, including such topics as dislocation stress fields, self-energy, velocity, interaction mechanisms, image forces, and theories of yielding. *Prereq.* A recent introductory materials science course.

ME 3251 Advanced Physical Metallurgy 2 **2 QH**
As Announced

Studies mechanical behavior of metals. Covers application of dislocation theory to micro-plasticity, strain hardening, strengthening mechanisms, and creep. *Prereq.* ME 3250.

ME 3252 Advanced Physical Metallurgy **4 QH**
Fall Quarter

Embodies the material in ME 3250 and ME 3251. *Prereq.* A recent introductory materials science course.

ME 3260 Thermodynamics of Materials 1 **2 QH**
As Announced

Presents basic metallurgical thermodynamics encompassing first, second, and third laws, entropy, enthalpy, and free energy. *Prereq.* Engineering materials.

ME 3261 Thermodynamics of Materials 2 **2 QH**
As Announced

Continues ME 3260, emphasizing solutions, activity, activity coefficients, the phase rule, and applications to some metallurgical problems. *Prereq.* ME 3260.

ME 3264 Thermodynamics of Materials **4 QH**
Winter Quarter

Embodies the material in ME 3260 and ME 3261. *Prereq.* Engineering materials.

ME 3270 Materials Science and Engineering 1 **2 QH**
As Announced

Explores the principles underlying the structure and properties of solid materials. Considers the

relationships of these principles to the properties and to applications in structures and devices. Uses both macroscopic-phenomenological and electronic-molecular approaches. Includes metals, alloys, semiconductors, and dielectrics. Topics may include atomic and electronic structures, ordering, nucleation, crystal growth, and thermal properties. *Prereq.* A recent introductory materials science course.

ME 3271 Materials Science and Engineering 2 **2 QH**
As Announced

Continues ME 3270. Considers topics such as electric, magnetic, and optical properties; applications of solid-state phenomena to achieve functions embodied in transducers, filters, amplifiers, energy converters, and so forth. *Prereq.* ME 3270.

ME 3272 Materials Science and Engineering **4 QH**
Fall Quarter

Embodies the material in ME 3270 and ME 3271. *Prereq.* A recent introductory materials science course.

ME 3341 Power Generating Systems 1 **2 QH**
As Announced

Examines power generating systems that employ fossil, nuclear, and heat recovery boilers operating in conjunction with steam and organic Rankine cycles. Studies the steady-state and transient operation of each power-generating system from both an analytical and conceptual point of view. Presents the effect that site conditions, fuel quality, plant loading schedule, and environmental regulations have on system design, performance, and operation. *Prereq.* ME 3200 or equiv., or may be taken concurrently with permission of instructor.

ME 3342 Power Generating Systems 2 **2 QH**
As Announced

Continues ME 3341. Examines systems incorporating gas, hydraulic, and wind turbines, solar and fuel cells, energy storage, combined cycles, and cogenerating systems. Aims to develop, in conjunction with ME 3341, the skills needed to conduct sound technical evaluations of the power generating systems being built today. *Prereq.* ME 3341.

ME 3343 Power Generation Economics and Planning **2 QH**
As Announced

Examines current and constant-dollar power generation costs. Considers life-cycle economic analysis, such as revenue requirements, discounted cash flow, internal rate of return, and payback analyses. Presents the planning methodologies used by electric utilities and private industry to evaluate and select power generating systems. *Prereq.* ME 3342.

ME 3351 Solar Thermal Engineering 1 **2 QH**
As Announced

Develops a model for the hourly direct and diffuse radiation under a cover of scattered clouds and the transmission and absorption of this radiation by passive and active systems. Considers the design of air heating systems, and the storage of the collected energy by a pebble-bed, as well as elements of heat exchanger design. Studies the economics of a domestic

water and/or space heating system using f-chart analysis. *Prereq.* CHE 3660 or equiv.

ME 3352 Solar Thermal Engineering 2 2 QH
As Announced

Considers design and analysis issues of several solar thermal systems, such as LiBr-H₂O absorption cooling units, heat pumps, compound parabolic collectors, and the heat pipe type of solar collector. *Prereq.* ME 3351.

ME 3360 Turbomachinery Design 4 QH
Fall Quarter

Presents preliminary design methods and analytical tools applicable to turbomachinery. Discusses design criteria and performance characteristics at design and off-design operating conditions for several important types of turbomachinery. Studies axial flow compressors and turbines (gas and steam) in depth, including topics such as compressor surge, turbine blade cooling, steam wetness effects, centrifugal compressors, radial inflow turbine, pumps, fans, and water turbines. Examines turbomachinery mechanical design limitations, the use of empirical data on blade cascade performance in blade selection, and numerical methods of analyzing two- and three-dimensional flows in turbomachinery (for example, conformal transformation and streamline curvature). Two in-depth design projects are assigned. This material is also covered in the two 2 QH courses, ME 3361 and ME 3362. *Prereq.* Admission to the Graduate School of Engineering, including undergraduate preparation in fluid mechanics and thermodynamics.

ME 3361 Turbomachinery Design 1 2 QH
As Announced

ME 3361 and ME 3362 present the same material contained in ME 3360, but in two 2 QH courses. *Prereq.* Admission to the Graduate School of Engineering, including undergraduate preparation in fluid mechanics and thermodynamics.

ME 3362 Turbomachinery Design 2 2 QH
As Announced

Continues ME 3361. *Prereq.* ME 3361.

ME 3370 Fundamentals of Maintenance in Design 4 QH
Spring Quarter, Odd Years

Covers basic tools of probability analysis. Presents failure modes and actual functional behavior of designed components in the probability forms, and age reliability. Offers nondescriptive evaluation techniques and demonstration tests. Explores fault tree analysis and decision logic. *Prereq.* Admission to the Graduate School of Engineering.

ME 3380 Fundamentals of Instrumentation 2 QH
Fall Quarter, Even Years

Discusses the theoretical principles underlying the design and operation of instruments for measurement and/or control. Analyzes stimulus-response relations, and covers industrial instruments for measurement and control, including those based on pneumatic and electrical systems. *Prereq.* BS degree.

ME 3381 Industrial Process Control 2 QH
Winter Quarter, Even Years

Introduces fundamental principles involved in automatic control of industrial processes. Considers economics, and the application of control instruments to obtain automatic control of temperature, pressure, fluid flow, liquid level, humidity, and PH. *Prereq.* ME 3380.

ME 3386 Nuclear Engineering 1 2 QH
As Announced

Studies the growth of the nuclear power industry; nuclear physics, emphasizing atomic and nuclear structure, radioactive decay, and nuclear reactions with particular attention to fission and fusion. Examines radiation health physics, principles of shielding, nuclear instrumentation; production and application of radioisotopes, neutron interactions and slowing down theory, and neutron activation analysis. Not open to students who have completed ME 1541 and ME 1542. *Prereq.* Admission to the Graduate School of Engineering.

ME 3387 Nuclear Engineering 2 2 QH
As Announced

Compares thermal, fast, and breeder reactors. Explores four factor formula and the neutron diffusion equation; one-group, modified one-group, two-group and multi-group theory; bare and reflected thermal reactors; energy production and distribution within core; and flux shaping. Topics include transient reactor behavior and control; factors affecting reactivity including temperature, pressure, void formation, fission product accumulation, fuel depletion and fuel breeding; and Xenon buildup after shutdown. Not open to students who have completed ME 1541 and ME 1542. *Prereq.* ME 3386.

ME 3388 Nuclear Engineering 3 2 QH
As Announced

Presents reactor design considerations, and the interrelationship of reactor physics, control, engineering, materials, safety, and fuel cycle management. Topics include reactor types, radiation damage and reactor materials, nuclear fuels, reactor heat transfer, economics of nuclear power, and environmental effects. Not open to students who have completed ME 1541 and ME 1542. *Prereq.* ME 3387.

ME 3400 Advanced Math Methods for Mechanical 4 QH
Engineers

Fall Quarter, Odd Years

Embodies the material in ME 3401 and 3402. *Prereq.* ME 3100.

ME 3401 Advanced Math Methods for Mechanical 2 QH
Engineers 1

As Announced

Studies matrices and linear equations, variational calculus and applications, approximate methods of engineering analysis, and selected topics of current interest. *Prereq.* ME 3101 and ME 3102.

ME 3402 Advanced Math Methods for Mechanical Engineers 2 2 QH**As Announced**

Discusses integral transforms, asymptotic expansion, and regular and singular perturbation methods. Draws examples from solid mechanics, vibration, and fluid mechanics. *Prereq.* ME 3101 and ME 3102.

ME 3410 Numerical Methods in Mechanical Engineering 4 QH**Winter Quarter**

Presents numerical methods applied to problems in mechanical engineering. Considers solution of linear and nonlinear systems of equations, interpolation, numerical differentiation and integration, and numerical solution of ordinary differential equations. Includes explicit and implicit methods, multistep methods, and predictor-corrector methods. Studies numerical solution of partial differential equations with emphasis on parabolic and elliptic problems occurring in mechanical engineering. This material is also covered in the two 2 QH courses ME 3411 and ME 3412. *Prereq.* ME 3100.

ME 3411 Numerical Methods in Mechanical Engineering 1 2 QH**As Announced**

ME 3411 and ME 3412 present the same material with the same prerequisites as ME 3410, but in two 2 QH courses.

ME 3412 Numerical Methods in Mechanical Engineering 2 2 QH**As Announced**

Continues ME 3411. *Prereq.* ME 3411.

ME 3420 Mechanics of Inelastic Solids 4 QH**As Announced**

Studies constitutive relations governing inelastic solids, including yield surface, plastic stress-strain relations, and Prandtl-Reuss equations. Examines viscoelastic stress-strain relations, the Maxwell and Voigt models, as well as viscoplasticity. *Not available to students who have taken ME 3421. Prereq.* ME 3122.

ME 3421 Introduction to Plasticity 2 QH**Winter Quarter, Even Years**

Presents basic experimental information. Reviews stress and strain tensors, elastic stress-strain relations, yield surface, plastic stress-strain relations, Prandtl-Reuss equations, and simple applications. *Prereq.* ME 3121.

ME 3423 Theory of Elasticity 3 2 QH**Spring Quarter, Odd Years**

Discusses approximate solutions for stress and displacement distributions in elastic solids, and discrete solutions using finite difference and finite element methods. Covers energy principles and the calculus of variations, and the use of energy principles to obtain approximate continuous solutions. *Prereq.* ME 3122.

ME 3431 Engineering Fracture Mechanics 4 QH**Fall Quarter, Odd Years**

Embodies the material in ME 3432 and ME 3433. *Prereq.* ME 3120.

ME 3432 Engineering Fracture Mechanics 1 2 QH**As Announced**

Examines the fundamentals of brittle fracture, theoretical strength, micro/macro fracture characteristic, Inglis-Griffith theory, and applicability. Topics include linear elastic fracture mechanics; Orewan/Irwin extension to metals, effective surface tension, and relation to fracture toughness; plastic zone size correction; geometry effects on fracture toughness; and plane strain/plane stress fracture toughness, and thickness effects. *Prereq.* ME 3122.

ME 3433 Engineering Fracture Mechanics 2 2 QH**As Announced**

Focuses on experimental determination of fracture toughness, slow crack growth "pop in," arrest, R-G curves, and compliance techniques for determining elastic energy release rate. Considers alternate fracture toughness concepts, including resistance curve, crack opening displacement, and the J integral. Studies the application of fracture mechanics to fatigue, and emphasizes design methods to minimize risks of catastrophic failure. *Prereq.* ME 3432.

ME 3434 Engineering Fracture Mechanics 3 2 QH**As Announced**

Studies application of fracture mechanics to fatigue, strain energy density criteria for fracture, arrest criteria, and includes a "Work of Fracture" specimen. Considers the application of fracture mechanics to structural analysis, and the effect of anisotropy in fracture mechanics. Examines fracture dynamics, dynamic fracture toughness, strain rate effects, microsecond fracture phenomenon and criteria, spall, Butcher-Tuler criterion, and NAG model. Emphasizes the residual strength and design approaches. *Prereq.* ME 3433.

ME 3440 Advanced Mechanics of Materials 4 QH**Winter Quarter**

Embodies the material in ME 3441 and ME 3442. *Prereq.* Admission to the Graduate School of Engineering.

ME 3441 Advanced Mechanics of Materials 1 2 QH**As Announced**

Reviews fundamental stress and deformation concepts, and strain energy density. Introduces energy methods with application to beams, frames and rings. Discusses the Ritz method. *Prereq.* Admission to the Graduate School of Engineering.

ME 3442 Advanced Mechanics of Materials 2 2 QH**As Announced**

Investigates beams on elastic foundations and the concept of stability as applied to one and two degree-of-freedom systems. Topics include buckling of bars, frames, and rings. *Prereq.* ME 3441.

ME 3443 Advanced Mechanics of Materials 3 2 QH
As Announced

Offers selected topics in advanced mechanics.
Prereq. ME 3442 or permission of instructor.

ME 3446 Theory of Shells 2 QH
Spring Quarter, Odd Years

Studies membrane theory of shells, analyzes cylindrical shells, and examines the general theory of thin elastic shells and shells of revolution. *Prereq. ME 3122.*

ME 3455 Mechanics of Composite Materials 2 QH
Winter Quarter, Odd Years

Focuses on constitutive equations for anisotropic laminated composite materials, and application to the structural response of beams and plates. Discusses bending and buckling of symmetric and non-symmetric laminates. *Prereq. ME 3121.*

ME 3464 Automatic Control Engineering 4 QH
Fall Quarter, Even Years

Embodies the material in ME 3466 and ME 3467. *Prereq. ME 3140.*

ME 3466 Automatic Control Engineering 1 2 QH
As Announced

Studies control action, and the analysis and design by use of root-locus and frequency-domain techniques. *Prereq. ME 3142 or permission of instructor.*

ME 3467 Automatic Control Engineering 2 2 QH
As Announced

Offers further consideration of linear systems including compensation methods and multiple-input, and the techniques for the treatment of nonlinear systems. *Prereq. ME 3466.*

ME 3468 Robot Mechanics and Control 4 QH
Fall Quarter

Focuses on kinematics and dynamics of robot manipulators. Covers the development of kinematic equations of manipulators, the inverse kinematic problems, and motion trajectories. Explores the dynamics of manipulators for the purpose of control, employing Lagrangian mechanics, and considers the control and programming of robot manipulators. Discusses steady state errors and calculations of servo parameters, as well as high-level programming languages. *Prereq. Admission to the Graduate School of Engineering.*

ME 3470 Vibration Theory and Applications 4 QH
Spring Quarter

Embodies the material in ME 3472 and ME 3473. *Prereq. ME 3142 or ME 3471.*

ME 3472 Vibration Theory and Applications 1 2 QH
As Announced

Investigates Laplace transformation techniques, phase-plane diagrams, multiple-degree-of-freedom systems, and free and forced vibrations with and without damping. *Prereq. ME 3471, ME 3142, or permission of instructor.*

ME 3473 Vibration Theory and Applications 2 2 QH
As Announced

Presents systems with distributed mass and stiffness, extensional, torsional, and flexural vibrations of bars. *Prereq. ME 3472.*

ME 3474 Vibration Theory and Applications 3 2 QH
As Announced

Offers selected topics of current interest in vibrations. *Prereq. ME 3473.*

ME 3475 Random Vibration 2 QH
As Announced

Presents a description of stochastic processes, and explores the impulse response and frequency response of linear time-invariant dynamic systems. Examines correlations and spectra of stationary response, crossing rates, peaks, and envelopes. Topics include failure under random loading; poisson pulse processes; measurement, identification, and response problems; coherence; space-time correlations and cross-spectra; digital data processing; and applications to vehicles and structures subjected to wide-band excitation. *Prereq. ME 3473.*

ME 3480 The Finite Element Method 4 QH
Spring Quarter

Embodies the material in ME 3481 and ME 3482. *Prereq. ME 3101 and ME 3102 or permission of instructor.*

ME 3481 Finite Element Analysis 2 QH
As Announced

Introduces the finite element method, including variational formulations, simple interpolation functions, and element stiffness matrices. Discusses triangular and rectangular elements, assembly technique and constraining of resulting equations, and elementary applications. *Prereq. ME 3101 and ME 3102 or permission of the instructor.*

ME 3482 Advanced Finite Element Method 1 2 QH
As Announced

Examines isoparametric element formulation of higher-order and three-dimensional elements. Studies the Rayleigh-Ritz and Galerkin formulations. Considers applications of finite element theory to mechanical engineering problems in the areas of solid mechanics, heat transfer, and fluid mechanics. Reviews the use of a finite element general purpose commercial package. *Prereq. ME 3481.*

ME 3483 Advanced Finite Element Method 2 2 QH
Fall Quarter, Even Years

Explores the dynamic finite element formulation with explicit and implicit time integration schemes for transient analysis. Studies solution methods for finite element equilibrium equations, including material and geometrical nonlinearities. Presents the general structure of computer procedures and codes, the influence of computer-aided design technology, and the use of an in-house general purpose commercial code. *Prereq. ME 3482.*

ME 3500 Computer-Aided Graphics and Design 4 QH
Winter Quarter

Covers the basic aspects of interactive computer graphics. Topics include hardware and software concepts, design principles for the user-computer interface, geometrical transformation, display architecture, and data structures. Studies algorithms for removing hidden edges and surfaces, shading models, and intensity and colors. Considers the concepts of computational and numerical geometry and design of curves and surfaces. Examines solid modeling techniques, and discusses in-house computer-aided graphics and design packages. *Prereq.* Admission to the Graduate School of Engineering and programming experience.

ME 3510 Manufacturing Machine Programming 4 QH
Spring Quarter, Even Years

Focuses on manufacturing and its relationship to design and computers. Covers fundamentals of manufacturing methods and systems. Examines relationship between design and various aspects of manufacturing. Discusses computer modeling and related aids of various manufacturing activities. Topics include manufacturing systems, manufacturing processes, mechanical tolerancing, manufacturing features, process planning, principles of part programming (NC, CNC, DNC), and integrating CAD and CAM databases. Includes discussions of CAM packages. Students may use in-house CAD and CAM facilities. *Prereq.* ME 3500 or permission of instructor.

ME 3520 Experimental Techniques in Design 4 QH
Winter Quarter, Odd Years

In mechanical engineering, there is usually a need for verifying material properties, response simulation of the design element, proof tests, and nondestructive testing of components. Uses design case histories in defining appropriate experimentation needed for verification, simulation, proof tests, and inspection. These experiments may include tensile, fatigue, fracture toughness, vibration analysis, thermofluid analysis, and nondestructive testing. Discusses the techniques associated with these experiments and methods of optimizing and acquiring data. *Prereq.* Admission to the Graduate School of Engineering.

ME 3525 Manufacturing Methods for Engineers 4 QH
Spring Quarter, Odd Years

Focuses on manufacturing processes and their effects on the design and performance of engineering products. Discusses the current processes and their applications, then the design and manufacturing of products made of materials such as polymers and composites. Introduces design and manufacturing of electronic components. Laboratory demonstrations illustrate various manufacturing processes. *Prereq.* Admission to the Graduate School of Engineering.

ME 3540 Heat Conduction and Thermal Radiation 4 QH
Winter Quarter

Studies the formulation of steady and unsteady state one- and multidimensional heat conduction problems. Examines solution techniques for linear problems including the method of separation of variables,

Laplace transforms, and integral transforms. Discusses approximate analytical methods, phase change problems, nonlinear problems, the nature of thermal radiation, blackbody, and radiation from a blackbody. Presents radiation from a nonblack surface element, and radiative exchange among surfaces separated by a nonparticipating medium. Investigates the interaction of radiation with other modes of heat transfer in nonparticipating media. Numerical techniques in heat transfer are covered in ME 3410. This material is also covered in the two 2 QH courses ME 3541 and ME 3542. *Prereq.* ME 3100 and undergraduate course in heat transfer.

ME 3541 Heat Conduction and Thermal Radiation 1 2 QH
As Announced

ME 3541 and ME 3542 present the same material with same prerequisites as ME 3540, but in two 2 QH courses.

ME 3542 Heat Conduction and Thermal Radiation 2 2 QH
As Announced

Continues ME 3541. *Prereq.* ME 3541.

ME 3544 Convective Heat Transfer 4 QH
Fall Quarter

Studies fundamental equations of convective heat transfer, heat transfer in incompressible external laminar boundary layers, and integral boundary layer equations. Examines laminar forced convection in internal flows, and turbulent forced convection in internal and external flows. Draws analogies between heat and momentum transfer, including the Reynolds, Taylor, and Martinelli analogies. Topics include natural convection, heat transfer in high-speed flow, transient forced convection, and convection and radiation in nonparticipating media. This material is also covered in the two 2 QH courses ME 3545 and ME 3546. *Prereq.* ME 3100, ME 3210, and undergraduate course in heat transfer.

ME 3545 Convective Heat Transfer 1 2 QH
As Announced

ME 3545 and ME 3546 present the same material with the same prerequisites as ME 3544, but in two 2 QH courses.

ME 3546 Convective Heat Transfer 2 2 QH
As Announced

Continues ME 3545. *Prereq.* ME 3545.

ME 3548 Radiative Transfer 4 QH
Spring Quarter, Even Years

Examines electromagnetic background, and the fundamentals of radiation in absorbing, emitting, and scattering media. Studies the equation of radiative transfer, approximate methods in the solution of the equation of radiative transfer, and singular-eigenfunction expansion technique. Discusses pure radiative transfer in participating media, interaction of radiation with conduction and/or convection, and the Monte Carlo technique. This material is also covered in the two 2 QH courses ME 3549 and ME 3550. *Prereq.* ME 3540.

ME 3549 Radiative Transfer 1 As Announced ME 3549 and ME 3550 present the same material with the same prerequisites as ME 3548, but in two 2 QH courses.	2 QH
ME 3550 Radiative Transfer 2 As Announced Continues ME 3549. <i>Prereq. ME 3549.</i>	2 QH
ME 3552 Two Phase Flow Winter Quarter, Even Years Studies the basic concepts of heat and mass transfer associated with phase change and multiphase flows. Discusses boiling heat transfer (nucleate boiling, film boiling, and bubble dynamics); evaporation and condensation; liquid-gas two phase flow, and gas-solid and liquid-solid two phase flows. This material is also covered in the two 2 QH courses ME 3553 and ME 3554. <i>Prereq. ME 3100 (or equiv.) and undergraduate course in heat transfer.</i>	4 QH
ME 3553 Two Phase Flow 1 As Announced ME 3553 and ME 3554 present the same material as ME 3552 with the same prerequisites, but in two 2 QH courses.	2 QH
ME 3554 Two Phase Flow 2 As Announced Continues ME 3553. <i>Prereq. ME 3553.</i>	2 QH
ME 3556 Heat Transfer Processes in Microelectronic Devices Spring Quarter Discusses and develops state of the art methods used to predict the heat transfer rates from microelectronic devices and packages and to simulate transport phenomena in manufacturing processes associated with microelectronic devices. Topics, selected from the current literature, may include use of latent heat reservoirs, boiling jet impingement cooling, control volume approaches to extended surfaces, and calculation of thermal contact conductances and natural convection in enclosures. Develops simulation of laser-assisted thermophoretic deposition and laser cladding processes. This material is also contained in the two 2 QH courses ME 3557 and ME 3558. <i>Prereq. ME 3100 (or equiv.) and undergraduate course in heat transfer or permission of instructor.</i>	4 QH
ME 3557 Heat Transfer Processes in Microelectronic Devices 1 As Announced ME 3557 and ME 3558 provide the same material as ME 3556 with the same prerequisites, but in two 2 QH courses.	2 QH
ME 3558 Heat Transfer Processes in Microelectronic Devices 2 As Announced Continues ME 3557. <i>Prereq. ME 3557.</i>	2 QH
ME 3560 Viscous Flow Winter Quarter, Odd Years Reviews conservation of mass, momentum, and energy for compressible viscous flow. Discusses the	4 QH

mathematical character of the basic equations and analysis of some exact solutions. Investigates low Reynolds number flow, exact and approximate approaches to laminar boundary layers in high Reynolds number flows, and stability of laminar flows and the transition to turbulence. Considers incompressible turbulent mean flow, internal and external flows, and extensions to compressible boundary layers. This material is also covered in the two 2 QH courses ME 3561 and ME 3562. *Prereq. ME 3100 and ME 3210.*

ME 3561 Viscous Flow 1
As Announced
ME 3561 and ME 3562 present the same material with the same prerequisites as ME 3560, but in two 2 QH courses.

ME 3562 Viscous Flow 2
As Announced
Continues ME 3561. *Prereq. ME 3561.*

ME 3564 Gas Dynamics
Spring Quarter, Odd Years
Studies the consequences of fluid compressibility. Discusses shock waves and the theory of characteristics, focusing on two-dimensional steady flows and one-dimensional unsteady flows. Topics may include axially symmetric steady flow, small perturbation theory, similitude rules, the hodograph method, or some aspects of physical acoustics. This material is also contained in the two 2 QH courses ME 3565 and ME 3566. *Prereq. ME 3210.*

ME 3565 Gas Dynamics 1
As Announced
ME 3565 and ME 3566 present the same material with the same prerequisites as ME 3564, but in two 2 QH courses. *Prereq. ME 3210.*

ME 3566 Gas Dynamics 2
As Announced
Continues ME 3565. *Prereq. ME 3565.*

ME 3568 Computational Fluid Dynamics with Heat Transfer
Spring Quarter
Examines finite difference methods for solving partial differential equations with particular emphasis on the equations of fluid dynamics and convective heat transfer. Discusses integral methods for boundary layers and their coupling to potential flow solutions. Considers the use of coordinate transformations and body-oriented coordinate systems. Presents the application of superposition techniques in convective heat transfer problems. This material is also covered in the two 2 QH courses ME 3569 and ME 3570. *Prereq. ME 3210 and ME 3410.*

ME 3569 Computational Fluid Dynamics with Heat Transfer 1
As Announced
ME 3569 and ME 3570 present the same material with the same prerequisites as ME 3568, but in two 2 QH courses.

ME 3570 Computational Fluid Dynamics with Heat Transfer 2 2 QH
As Announced
 Continues ME 3569. *Prereq.* ME 3569.

ME 3572 Aerosol Mechanics 4 QH
As Announced
 Studies the behavior of ultrafine particles from both microscopic and macroscopic viewpoints. Discusses the microscopic origins of aerosol transport phenomena including Brownian diffusion, drag, thermopres-
 isis, condensation, and evaporation. Examines deposition processes for monodisperse aerosols including distribution function for polydisperse aerosols, the general dynamic equation and methods of solution, homogeneous nucleation, and coagulation. Introduces industrial applications. *Prereq.* ME 3100, ME 3200, ME 3210, or permission of instructor.

ME 3580 Statistical Thermodynamics 4 QH
Spring Quarter, Even Years
 Introduces mechanical engineers to statistical thermodynamics, providing insight into the laws of classical thermodynamics and the behavior of substances. Topics include introduction to probability; elementary kinetic theory of an ideal gas, including the distribution of molecular velocities and the mean free path treatment of transport properties; classical statistics of independent particles, equipartition of energy, the partition function and laws of thermodynamics; some results from quantum mechanics, quantum statistics of independent particles; applications to gases; introduction to ensembles and systems of interacting particles. This material is also contained in the two 2 QH courses ME 3581 and ME 3582. *Prereq.* ME 3100 and ME 3200 or equiv.

ME 3581 Statistical Thermodynamics 1 2 QH
As Announced
 ME 3581 and ME 3582 present the same material with the same prerequisites as ME 3580, but in two 2 QH courses.

ME 3582 Statistical Thermodynamics 2 2 QH
As Announced
 Continues ME 3581. *Prereq.* ME 3581.

ME 3584 Fundamentals of Combustion 4 QH
Fall Quarter, Even Years
 Offers comprehensive treatment of the problems involved in the combustion of liquid, gaseous, and solid fuels in both laminar and turbulent flow. Discusses the fundamentals of chemical kinetics, and examines the equations for the transport of mass, momentum, and energy with chemically reacting gases. Topics include diffusion and premixed flames, combustion of droplets and sprays, and gasification and combustion of coal. This material is also presented in the two 2 QH courses ME 3585 and ME 3586. *Prereq.* ME 3200.

ME 3585 Fundamentals of Combustion 1 2 QH
As Announced
 ME 3585 and ME 3586 present the same material as ME 3584, with same prerequisites, but in two 2 QH courses.

ME 3586 Fundamentals of Combustion 2 2 QH
As Announced
 Continues ME 3585. *Prereq.* ME 3585.

ME 3600 Advanced Physical Metallurgy 3 2 QH
Winter Quarter
 Studies the kinetics of phase transformations in metals. Topics include kinetic theory, empirical kinetics, diffusion in metals, nucleation, diffusional growth, and martensitic transformations. *Prereq.* ME 3620.

ME 3601 Thermodynamics of Materials 3 2 QH
Spring Quarter
 Examines the application of metallurgical thermodynamics to various process metallurgical problems, such as gas-solid systems, plus kinetics of reactions, and dynamic systems analysis. *Prereq.* ME 3260.

ME 3602 Materials Science and Engineering 3 2 QH
Winter Quarter
 Continues ME 3271 with a discussion of various special topics that vary from year to year. For example metastable phases and thin films. *Prereq.* ME 3271.

ME 3603 Corrosion 2 QH
Fall Quarter, Even Years
 Studies the thermodynamics of corrosion and corrosion reactions both in aqueous and non-aqueous environments. Topics include thermodynamics, kinetics, and the effects of environment and physical metallurgy. *Prereq.* Admission to the Graduate School of Engineering.

ME 3604 Oxidation 2 QH
Winter Quarter, Even Years
 Continues ME 3603. *Prereq.* ME 3603.

ME 3605 Electronic Materials 1 2 QH
As Announced
 Presents generic techniques for fabrication and processing, and the resulting structure-property relationships, for materials utilized in electronics. Materials may include bulk single crystals, thin films, metals, semiconductors, and insulators. *Prereq.* ME 3271.

ME 3606 Electronic Materials 2 2 QH
As Announced
 Continues ME 3605. *Prereq.* ME 3605.

ME 3607 Electronic Materials 4 QH
Spring Quarter
 Embodies the material in ME 3605 and ME 3606. *Prereq.* A course in material science and engineering.

ME 3610 Introduction to Diffraction Methods in Material Science 2 QH
As Announced
 Studies the general principles of the diffraction by materials of short wave length radiations, such as X-ray, electrons, and thermal neutrons. Focuses on the similarities and differences of the different radiations when applied to the study of the structures of crystalline and noncrystalline materials. *Prereq.* A recent introductory materials science course.

ME 3611 Diffraction Methods in Material Science 2 QH
As Announced

Continues ME 3610, emphasizing experimental methods and applications. Topics include choice of radiation, introduction to instrumentation, sample preparation, methods of detection and recording of the diffracted radiation, and analysis, interpretation and use of the results. *Prereq. ME 3610.*

ME 3612 Microstructure Analysis 1 2 QH
As Announced

Discusses the principles of scanning and transmission electron microscopy, including image interpretation in transmission electron microscopy with an emphasis on the study of the relationships between microstructure and properties of materials. Considers application of kinematical and dynamical theories of electron diffraction to quantitative analyses of point defects, dislocations, precipitates, and grain boundaries. Includes laboratory demonstration of TEM and SEM operation. *Prereq. Admission to the Graduate School of Engineering.*

ME 3613 Microstructure Analysis 2 2 QH
As Announced

Continues ME 3612. *Prereq. ME 3612.*

ME 3620 Powder Metallurgy 2 QH
Spring Quarter, Even Years

Studies powder characteristics and methods of manufacturing. Considers powder pressing, including packing, interparticle bonding, and effects of pressure. Discusses the principles of sintering, as well as the characteristics and properties of products made from powdered materials. *Prereq. A recent introductory materials science course.*

ME 3625 Physical Ceramics 1 2 QH
Fall Quarter, Even Years

Introduces ceramic fabrication processes, including the characteristics of vitreous and crystalline solids, structural imperfections, and atomic mobility. Explores phase equilibria, nucleation, crystal growth, solid-state reactions, non-equilibrium phases, and effects on the resulting microstructure of ceramics. *Prereq. A recent introductory materials science, physical chemistry, or solid state physics course.*

ME 3626 Physical Ceramics 2 2 QH
Winter Quarter, Even Years

Discusses the effects of composition and microstructure on the thermal, mechanical, optical, electrical, and magnetic properties of ceramic materials. *Prereq. ME 3625.*

ME 3630 The Structure and Properties of Polymeric Materials 1 2 QH
Fall Quarter, Even Years

Introduces the organic chemistry of polymers, effect of chemical composition on structure, melting point and glass transition temperature, polymer characterization and degradation, and thermodynamics of polymers. *Prereq. Undergraduate materials science course.*

ME 3631 The Structure and Properties of Polymeric Materials 2 2 QH
Winter Quarter, Even Years

Examines rheology and mechanical behavior of polymers, analysis and testing, effects of processing on structure and physical properties, industrial polymers, and resin base composites. *Prereq. ME 3630.*

ME 3640 Computer Modeling of Materials Processing 2 QH
As Announced

Focuses on the use of numerical methods for modeling a variety of materials processes, for example, melting, oxidation, reduction, the blast furnace, the cupola, rolling, and extrusion. *Prereq. Admission to the Graduate School of Engineering.*

ME 3641 Computer Modeling of Materials Properties 2 QH
As Announced

Uses various mathematical techniques and computer methods to develop models that describe the changes in a material's chemical, mechanical, and physical properties as the chemical composition and metallurgical variables are changed. *Prereq. Admission to the Graduate School of Engineering.*

ME 3797 Engineer Degree Continuation 0 QH
Any Quarter**ME 3798 Master's Degree Continuation 0 QH**
Any Quarter**ME 3799 Doctoral Continuation 0 QH**
Any Quarter**ME 3850 Special Problems in Mechanical Engineering 2 QH**
Any Quarter

Offers theoretical or experimental work under individual faculty supervision. *Prereq. Permission of department faculty.*

ME 3853 Special Topics in Mechanical Engineering 2 QH
Any Quarter

Presents topics of interest to the staff member conducting this class for advanced study. *Prereq. Permission of department faculty.*

ME 3854 Special Topics in Mechanical Engineering 4 QH
Any Quarter

Presents topics of interest to the staff member conducting this class for advanced study. *Prereq. Permission of department faculty.*

ME 3856 Doctoral Reading 2 QH
Any Quarter

Studies material approved by the candidate's adviser (only S or F grades will be assigned for this course). *Prereq. Passing of PhD qualifying exam.*

ME 3860 Master's Thesis 8 QH
Any Quarter

Includes analytical or experimental work conducted under the direction of the faculty in fulfillment of the requirements for the degree. First-year students must attend a graduate seminar program that will introduce the students to the methods of choosing a research topic, conducting research, and preparing a

thesis. Successful completion of the seminar program is required. *Prereq. Admission to the Graduate School of Engineering.*

ME 3861 Master's Thesis **4 QH**
Any Quarter
Same as ME 3860.

ME 3862 Master's Thesis **2 QH**
Any Quarter
Same as ME 3860.

ME 3870 Mechanical Engineer's Thesis **10 QH**
Any Quarter
Offers analytical and/or experimental work conducted under the auspices of the department. Open to day students only. *Prereq. Admission to the Mechanical Engineering Degree Program.*

ME 3871 Mechanical Engineer's Thesis **4 QH**
Any Quarter
Offers analytical or experimental work conducted under the auspices of the department. Open to day students only. *Prereq. Admission to the Mechanical Engineer Degree Program.*

ME 3872 Mechanical Engineer's Thesis **2 QH**
Any Quarter
Same as ME 3872.

ME 3880 Doctoral Dissertation **0 QH**
Any Quarter
Presents theoretical and experimental work conducted under the supervision of the department. Open to day students only. *Prereq. Admission to the Doctoral Program in Mechanical Engineering.*

Graduate School of Nursing

Core courses in the Graduate School of Nursing are as follows.

NUR 3101 Theoretical Foundations of Nursing 3 QH

Analyzes the development of the art and science of nursing. Includes systematic examination of major nursing theories and conceptual frameworks, elements of theory building, and theoretical frameworks from disciplines relevant to advanced nursing practice.

NUR 3102 Professional Issues in Nursing 3 QH

Addresses concepts basic to understanding the criteria for professionalism. Emphasizes ethical, legal, political, and economic issues that affect the individual practitioner, the profession, the client system, and the health care delivery system.

NUR 3103 Research Methods in Nursing I 3 QH

Focuses on the relationship of research to knowledge and advanced nursing practice. Emphasizes the scientific process, formulating research problems, study designs, measuring variables, collecting data, and testing hypothesis. Lectures, assigned readings, and class discussions provide opportunities to formulate research problems and designs. Students develop a preliminary research plan to complete in subsequent quarters. *Prereq.* Undergraduate statistics course that includes probability and hypothesis testing.

NUR 3104 Administrative Aspects of Nursing 3 QH

Emphasizes developing knowledge and skill in using theory to analyze organizational issues and roles in professional nursing. Focuses on organizational structure and process in relation to nursing service and health care delivery from various perspectives.

NUR 3105 Research Methods in Nursing 2 2 QH

Analyzes the research process and developing a research plan. Includes implementing survey methods, reliability and validity of norm-referenced and criterion-referenced measures, statistical applications, computer utilization and data processing, findings analysis, and disseminating and utilizing nursing research. Provides opportunities for computer data processing and analysis using SPSS-X software. Assists in developing the design and methodology of the student's research plan. *Prereq.* NUR 3103.

NUR 3106 Advanced Pathophysiology 3 QH

Emphasizes complex pathophysiological concepts essential to the care of individuals with life-threatening illness. Includes review of cellular physiology; physiologic dysfunction; physiologic adaptation to maintain the internal environment; and feedback and control mechanisms at the cellular, organ, and system levels of physiological functioning.

NUR 3107 Advanced Pharmacology 2 QH

Focuses on principles of pharmacology and the major drug classifications in relation to the treatment of health problems. Examines the effects of selected medications on pathophysiology and psychopathology.

NUR 3140 Curriculum Development in Nursing 3 QH

Focuses on curriculum development in nursing education. Includes history of nursing education, learning theories, criteria for programs in higher education, curriculum designs, testing and evaluation methods. Examines values, trends, and issues in contemporary nursing education.

NUR 3141 Teaching by Guided Design 3 QH

Provides experience in planning, implementing, and evaluating a teaching strategy in nursing education. Requires students to collaborate with course instructors and students to develop a guided design project that is implemented and evaluated in a baccalaureate nursing program. Seminars focus on preparing guided design projects, implementing strategies, and evaluating appropriately. Requires student teaching in a concurrent baccalaureate nursing course.

NUR 3142 Teaching Practicum 3 QH

Provides introductory experience to the nurse as teacher. Addresses evaluating and delineating the teaching role, developing collaborative and collegial relationships, and planning and directing change. Includes participating in classroom and clinical teaching, and investigating the broader role of educator in academic or institutional settings. Seminars focus on issues in education and specific student interests. *Prereq.* NUR 3140 or equiv.

Community Health Nursing

NUR 3200 Theoretical Foundations of Health 3 QH

Focuses on health, its theoretical development, and the health-illness continuum. Includes epidemiology, biostatistics, demography, environmental health, occupational health, and international health. Introduces issues in public health policy.

NUR 3201 Theories of Health Behavior 3 QH

Focuses on health, illness, sickness, and disability from nursing, sociological, psychological, cultural, and medical perspectives. Examines concepts, theories, and models that explain health-related behaviors. Explores the empirical foundation of

interventions designed to promote health and prevent disease in individuals living in the community.

NUR 3202 Theories of Family Health 3 QH

Investigates theoretical bases for family nursing practice. Includes selected family frameworks developed by nursing and other disciplines. Reviews and evaluates research studies of family health and their application to health care of families in the community.

NUR 3203 Theories of Community Health Nursing 4 QH

Examines theoretical bases for identification and analysis of factors that promote or inhibit community

health. Focuses on the development of strategies to meet health problems, and the role of nursing in community health care. *Prereq.* Concurrent *NUR 3200, NUR 3201, or NUR 3202.*

NUR 3204 Public Policy and Health Services Delivery 3 QH

Focuses on relevant planning, regulatory, and economic policies. Considers application of policies to developing, implementing, and evaluating programs to meet the health care needs of high-risk populations.

NUR 3205 Decision Making in the Delivery of Home Health Services 3 QH

Concentrates on relevant theories and their application to the decision-making processes which are the foundation of home health service delivery. Examines organizational, fiscal, and human resource factors.

NUR 3206 Case Management in Home Health Care 3 QH

Addresses application of case management skills to various client developmental stages and health states. Includes reimbursement, legal, organizational, ethical, and research issues involved in providing home health care.

NUR 3207 Role Development Seminar 3 QH

Explores the role of the clinical nurse specialist. Focuses on using collaboration and change strategies in various clinical settings. Includes experience in consultation, education, liaison, supervision, peer review, and referral. Students meet for seminar and are assigned to integrated specialty discussion groups focusing on issues related to advanced practice in nursing. *Prereq.* Concurrent with *NUR 3203.*

NUR 3211 Public Health Practicum 1 4 QH

Provides a clinical learning experience to test the theoretical bases for community health nursing practice with individuals, families, and communities. Includes an individually negotiated field placement related to public health nursing and a weekly didactic seminar with faculty. *Prereq.* Concurrent with *NUR 3203.*

NUR 3212 Home Health Care Administration Practicum 1 4 QH

Provides an administrative learning experience to test the theoretical bases for community health nursing practice. Involves negotiated field placement in a home health agency and a weekly didactic seminar with faculty. *Prereq.* Concurrent with *NUR 3203.*

NUR 3214 Public Health Practicum 2 4 QH

Provides a clinical learning experience integrating knowledge about role, management, organizational, and social behavior theories, and developing skills for advanced community health nursing practice. Includes a negotiated field placement related to public health and a weekly didactic seminar with faculty. *Prereq.* *NUR 3211.*

NUR 3215 Home Health Administration Practicum 2 4 QH

Provides an administrative learning experience integrating knowledge about role, management, organizational, and social behavior theories. Develops skills for advanced community health nursing practice.

Involves a negotiated field placement related to home health care administration and a weekly didactic seminar with faculty. *Prereq.* *NUR 3212.*

NUR 3220 Cultural Diversity in Nursing 3 QH

Explores the implications of cultural diversity for the advanced practice of nursing. Examines and critiques theoretical perspectives including medical anthropology and sociology as well as ethnomethodological analysis. Considers the epidemiology of folk illnesses and ethnic differences in morbidity and mortality; the students' own cultural health/illness perceptions as a basis for examining the perceptions of selected groups; methods for cultural assessment; and folk illnesses and traditional healers compared with western allopathic medical model.

NUR 3221 International Health 3 QH

Analyzes critically selected issues in international nursing. Includes international dimensions of health care; World Health Organization's approach to meeting international primary health care goals; cultural responses to health and illness; international organization for health care delivery; contemporary international health policy; research and theory relevant to international health care assessment, planning, intervention, and evaluation; and nursing roles in providing international health care.

NUR 3230 Research Practicum 2 QH

Provides an opportunity to work singly or in groups of from two to five students and an experienced researcher in a clinical specialization or other professional nursing interest. Individual contribution depends on the stage of the research project and is determined jointly by the student, faculty coordinator, and researcher. Includes evaluation of research process and collaboration as well as individual effort. *Prereq.* *NUR 3105.*

NUR 3231 Thesis Advisement 2 QH

Focuses on implementing the research project or thesis on community health nursing with assistance from faculty research advisers. Requires data collection, analysis, and presentation of research findings. *Prereq.* *NUR 3105.*

NUR 3240 Community Health Directed Study 2 QH

Allows students to develop an individualized plan to attain specific knowledge and skills related to professional goals. Consists of library study or reading, individual instruction, research, practicum, or other appropriate activity. *Prereq.* *Academic adviser's approval.*

NUR 3241 Community Health Directed Study 3 QH

Allows student to develop individualized plan to attain specific knowledge and skills related to professional goals. Consists of library study or reading, individual instruction, research, practicum, or other appropriate activity. *Prereq.* *Academic adviser's approval.*

NUR 3242 Community Health Directed Study 4 QH

Allows students to develop an individualized plan to attain specific knowledge and skills related to

professional goals. Consists of library study or reading, individual instruction, research, practicum, or

other appropriate activity. *Prereq.* Academic adviser's approval.

Critical Care Nursing

NUR 3301 Critical Care Concepts 3 QH

Explores the analysis and application of core behavioral, environmental, and psychosocial concepts essential to nursing care of individuals with critical health problems. Emphasizes critical evaluation of current nursing theory and research for potential application of findings in clinical practice. Includes opportunities to explore and develop concepts unique to each student's concentration area.

NUR 3302 Nursing Management of the Critically Ill 1 4 QH

Emphasizes theoretical knowledge essential to understanding life-threatening pathophysiological problems, nursing diagnosis, and related management of critically ill individuals and their families. Includes current theories and research from nursing, and physical and behavioral sciences as a basis for clinical decision making. Uses the frameworks of the nursing process and the life cycle to present course content. *Prereq.* NUR 3106 or equiv.

NUR 3303 Nursing Management of the Critically Ill 2 3 QH

Continues the discussion of theories essential to understanding life-threatening pathophysiological problems, nursing diagnosis, and related management of the critically ill and their families. Includes current theories and research from nursing and physical and behavioral sciences as a basis for clinical decision making. Considers models of nursing care delivery and ethical and legal issues related to critical care. *Prereq.* Concurrent with NUR 3107 or NUR 3302.

NUR 3304 Role Development Seminar 3 QH

Explores the role of the clinical nurse specialist. Focuses on collaboration and change strategies in various practice settings. Includes consultation, education, liaison, supervision, peer review and referral. Students meet for seminars and are assigned to integrated specialty discussion groups focusing on issues related to advanced nursing practice. *Prereq.* Concurrent with NUR 3302.

NUR 3311 Critical Care Nursing Practicum 1 4 QH

Provides a clinical learning experience in a concentration area of critical care nursing. Utilizes a variety of clinical settings and skilled agency preceptors to meet students' individual learning needs. Includes a weekly didactic seminar with faculty. *Prereq.* Concurrent with NUR 3302.

NUR 3312 Critical Care Nursing Practicum 2 4 QH

Continues learning experience in an individually negotiated clinical setting. Utilizes the clinical,

managerial, or teaching role of the clinical specialist in critical care nursing. Includes a weekly didactic seminar with faculty. *Prereq.* NUR 3311.

NUR 3313 Critical Care Nursing Practicum 3 4 QH

Provides intensive clinical learning experience in a concentration area of critical care nursing. Focuses on implementing the student's chosen functional role. Includes a weekly didactic seminar with faculty. *Prereq.* NUR 3312.

NUR 3330 Research Practicum 2 QH

Provides an opportunity to work singly or in groups with an experienced researcher in a clinical specialization or other professional nursing interest. Individual contribution depends on the stage of the research project and is determined jointly by the student, faculty coordinator, and researcher. Includes evaluation of research process and collaboration as well as individual effort. *Prereq.* NUR 3105.

NUR 3331 Research Advisement 2 QH

Focuses on implementing the research project or thesis on critical care nursing with assistance from faculty research advisers. Requires data collection, analysis, and presentation of research findings. *Prereq.* NUR 3105.

NUR 3340 Critical Care Directed Study 2 QH

Allows students to develop an individualized plan to attain specific knowledge and skills related to professional goals. Consists of library study or reading, individual instruction, research, practicum, or other appropriate activity. *Prereq.* Academic adviser's approval.

NUR 3341 Critical Care Directed Study 3 QH

Allows students to develop individualized plan to attain specific knowledge and skills related to professional goals. Consists of library study or reading, individual instruction, research, practicum, or other appropriate activity. *Prereq.* Academic adviser's approval.

NUR 3342 Critical Care Directed Study 4 QH

Allows students to develop an individualized plan to attain specific knowledge and skills related to professional goals. Consists of library study or reading, individual instruction, research, practicum, or other appropriate activity. *Prereq.* Academic adviser's approval.

Primary Care Nursing

NUR 3401 Primary Care of Well Children 3 QH

Focuses on assessing the health of newborns, well children, and their families. Discusses issues pertinent to normal development within a framework of anticipatory guidance and health promotion. Uses a comprehensive approach to preventive health care by examining the impact of psychological, sociological, developmental, and physiological factors on the child's health. Includes general guidelines for routine health care maintenance, screening developmental issues and family dynamics. Discusses common health concerns encountered in primary care settings.

Prereq. Concurrent with NUR 3106.

NUR 3409 Role Development Seminar 3 QH

Explores the role of the clinical nurse specialist and nurse practitioner. Focuses on using collaboration and change strategies in various practice settings. Includes consultation, education, liaison, supervision, peer review and referral. Students meet together for seminar and are assigned to integrated specialty groups to focus on issues related to advanced practice in nursing. *Prereq.* Concurrent with NUR 3402 or NUR 3405.

NUR 3412 Primary Care of Children Practicum 2 4 QH

Provides a clinical learning experience in delivering and coordinating primary care nursing services to children and their families. Focuses on assessing, diagnosing, and managing stable chronic conditions and acute episodic illnesses commonly encountered in childhood. Builds on a foundation of practice behaviors in health assessment, health promotion, and disease prevention. Involves an individual clinical placement with agency preceptor and a weekly didactic seminar with faculty. *Prereq.* NUR 3411.

NUR 3413 Primary Care of Adolescents Practicum 3 4 QH

Builds on previous clinical experience gained in NUR 3411 and NUR 3412. Students continue to provide care for children, adolescents, and their families, focusing on common adolescent concerns. Experience in two clinical sites provides opportunity to evaluate interdisciplinary role responsibilities and clinical practice standards. Includes a weekly didactic seminar to critically analyze clinical experiences and integrate theory, research, and primary care practice. *Prereq.* NUR 3412.

NUR 3414 Primary Care of Adults Practicum 1 3 QH

Provides a clinical learning experience in primary care nursing with adults in ambulatory settings. Uses a holistic approach to access the adult and family. Emphasizes identification of individuals at risk for health problems, as well as health promotion and health maintenance. Involves an individually negotiated clinical placement with agency preceptors and a weekly didactic seminar with faculty. *Prereq.* Concurrent with NUR 3403.

NUR 3415 Primary Care of Adults Practicum 2 4 QH

Provides a clinical learning experience which emphasizes delivery and coordination of primary care nursing services for adults and their families. Focuses on assessment, diagnosis and management of stable chronic conditions and episodic acute illnesses commonly encountered in adulthood. Builds on a foundation of practice behaviors in health assessment, health promotion and disease prevention. Includes an individual clinical placement with agency preceptor and a weekly didactic seminar with faculty. *Prereq.* NUR 3414.

NUR 3416 Primary Care of Adults Practicum 3 4 QH

Builds on the clinical learning experience of previous primary care nursing courses. Students continue to provide care for adults and older adults. Weekly seminar focuses on verifying and applying theory to concerns related to women's health and the multiple management problems associated with aging. Students are given greater responsibility in interdisciplinary practice.

NUR 3420 Rural Health Care 4 QH

Provides a concentrated, individual clinical learning experience in a rural health area for one month with supervision by an onsite preceptor. Focuses on assessing the community and developing a community health education program. Includes practice of primary care nursing skills with individuals and families. Requires students to present their rural health experience in a seminar upon completion of the course.

Prereq. Permission of the instructor.

NUR 3421 Health Care and Aging 3 QH

Focuses on the aging process and the health concerns of older persons, providing a theoretical basis for nurses to assist older adults to realize their potential. Considers interrelationships of biological changes, social changes, and psychological adjustments in the older person with emphasis on current issues and research related to the impact of these changes. Includes common health problems of the elderly; chronic disorders that affect the elderly; factors that influence available resources; and the roles and functions of the nurse in the care of the older person.

NUR 3430 Research Practicum 2 QH

Provides an opportunity to work singly or in groups with an experienced researcher in a clinical specialization or other professional nursing interest. Individual contribution depends on the stage of the research project and is determined jointly by the student, faculty coordinator, and researcher. Includes evaluation of research process and collaboration as well as individual effort. *Prereq.* NUR 3105.

NUR 3431 Thesis Advisement 2 QH

Focuses on implementing the research project or thesis on primary care nursing with assistance from faculty research advisers. Requires data collection,

analysis, and presentation of research findings.

Prereq. NUR 3105.

NUR 3440 Primary Care Directed Study 2 QH

Allows students to develop an individualized plan to attain specific knowledge and skills related to professional goals. Consists of library study or reading, individual instruction, research, practicum, or other appropriate activity. *Prereq.* Academic adviser's approval.

NUR 3441 Primary Care Directed Study 3 QH

Allows student to develop an individualized plan to attain specific knowledge and skills related to professional goals. Consists of library study or reading, individual instruction, research, practicum, or other appropriate activity. *Prereq.* Academic adviser's approval.

NUR 3442 Primary Care Directed Study 4 QH

Allows students to develop an individualized plan to attain specific knowledge and skills related to professional goals. Consists of library study or reading, individual instruction, research, practicum, or other appropriate activity. *Prereq.* Academic adviser's approval.

NUR 3443 Primary Care of Children Practicum 1 4 QH

Provides a clinical learning experience in the delivery and coordination of primary care service to children and their families. Focuses on performing a comprehensive health assessment of the child and family using a holistic approach. Emphasizes health promotion, health maintenance, and identification of individuals or families at risk. Involves an individual clinical placement with agency preceptor and a weekly didactic seminar with faculty. *Prereq.* Concurrent with NUR 3404.

NUR 3444 Primary Care of Adults Practicum 1 4 QH

Provides a clinical learning experience in primary care nursing with adults in ambulatory settings. Focuses on assessment of adults and older adults using a holistic approach. Emphasizes identifying individuals and families at risk for premature morbidity and mortality, using advanced health assessment techniques, and interpreting abnormal findings of physical examination. Involves an individual clinical placement with agency preceptor and a weekly didactic seminar with faculty. *Prereq.* Concurrent with NUR 3414.

NUR 3452 Primary Care of Child Health Problems 3 QH

Explores intellectual and attitudinal competencies necessary for performing successfully as primary

care nurses. Focuses on assessing, diagnosing, and managing children with acute and chronic stabilized illnesses. Considers family and community context, nurse practitioner role, and consultation and referral skills. *Prereq.* NUR 3401.

NUR 3453 Primary Care of Adolescents 3 QH

Builds on knowledge and skills developed in NUR 3401 and NUR 3402 to enhance development of cognitive and affective skills related to the care of the adolescent. Discusses developmental issues such as responsibility, health promotion, and disease prevention in this age group. Examines common health problems of reproductive health nutrition, dermatology, sports and activity-related injuries, and perinatal care. *Prereq.* NUR 3402.

NUR 3454 Primary Care of Well Adults 3 QH

Surveys health promotion as an integral aspect of adult health within the primary care context. Includes the impact of ecological, psychological, sociological, and physiological factors on adult health. Examines adult development as a framework to assess health needs and formulate intervention strategies for individuals and families. Reviews nursing issues related to integrating these techniques into the advanced practice role. *Prereq.* Concurrent with NUR 3106.

NUR 3455 Adult Health Problems 1 3 QH

Explores intellectual and attitudinal competencies necessary for performing successfully as primary care nurses. Focuses on assessing, diagnosing and managing adults and older adults with minor, acute, and stabilized chronic illnesses in the community and long-term care facilities. Emphasizes the nurse practitioner role in collaborative interdisciplinary management, consultation, and referral skills. *Prereq.* NUR 3404; concurrent with NUR 3107.

NUR 3456 Primary Care of Adult Health Problems 2 3 QH

Builds on knowledge and skills developed in NUR 3404 and NUR 3405. Focuses on common health problems of adults related to the reproductive system, sexuality, and health problems particular to the aged, poor, and homeless populations. Includes assessing and managing infectious diseases, women's health, musculoskeletal injury, and integumentary changes occurring with age. Discusses issues integral to delivery of primary care in traditional and nontraditional settings. *Prereq.* NUR 3405.

Psychiatric-Mental Health Nursing

NUR 3501 Human Behavior: Personality 3 QH

Focuses on the psychological structure, development, and functioning of the individual. Examines personality development as a progression of stages of growth facilitated or delayed by interpersonal and sociocultural factors. Explores basic theoretical concepts within various framework from the

psychoanalytic to the feminist. Examines literature from other disciplines relevant to psychiatric nursing practice.

NUR 3502 Human Behavior: Family Systems 3 QH

Introduces family dynamics, therapy, and research. Focuses on psychodynamics of the family, interaction

and communication process, family structure and organization, family dysfunction, and therapy practices. Uses family case studies and clinical media to demonstrate ways to observe, describe, analyze, and intervene in family-focused treatment situation. Reviews and evaluates research approaches to study of the family. *Prereq.* NUR 3501 or *equiv.*

NUR 3503 Dimensions of Community Mental Health 3 QH
Focuses on broad issues of community mental health, systems, and factors that influence services to diverse populations. Addresses the fundamentals of group process related to target populations in community mental health settings. Emphasizes interdisciplinary approaches to planning community services and designing prevention programs. Includes historical, political, economic, cultural, and professional issues relevant to the community mental health movement and the role of the psychiatric clinical nurse specialist in this area. *Prereq.* NUR 3502 or *equiv.*

NUR 3504 Psychopathology of Childhood 3 QH
Emphasizes psychopathological disorders throughout the developmental phases of infancy, early childhood, and latency. Focuses on diagnostic process and treatment planning for nursing intervention. Uses a psychoanalytic model primarily, but also discusses interactional, behavioral, and neurological models related to assessment, treatment, and prevention. Considers therapeutic work with parents. *Prereq.* Concurrent with NUR 3501 or *equiv.*

NUR 3505 Mental Health Problems of Adolescents 3 QH
Focuses on therapeutic management of adolescent health problems. Topics include assessment and adolescent suicide, self-destructive behavior, incest, drug and alcohol abuse, acting-out behavior, psychosis, and violence. Explores psychodynamic concepts, psychiatric referral process, and issues related to treatment and placement in the community. *Prereq.* NUR 3501 or *equiv.*

NUR 3506 Role Development Seminar 3 QH
Explores the role of the clinical nurse specialist. Focuses on the use of collaboration and change strategies in various practice settings. Includes consultation, education, liaison, supervision, peer review, and referral. Students meet for seminars and are assigned to integrated specialty groups focusing on issues related to advanced practice in nursing. *Prereq.* Concurrent with NUR 3501.

NUR 3511 Psychiatric Nursing Practicum 1 4 QH
Provides clinical experiences with adults or children and adolescents in psychiatric settings. Investigates techniques of observing, communicating, and interviewing in assessing individuals. Surveys basic psychopathology, differential diagnosis, psychopharmacology, and treatment planning within various psychodynamic formulations in a weekly didactic seminar with faculty. Students develop a caseload of selected clients and practice two days per week in a negotiated placement with an agency preceptor. *Prereq.* Concurrent with NUR 3501.

NUR 3512 Psychiatric Nursing Practicum 2 4 QH
Provides clinical experiences with adults or children and adolescents in psychiatric settings. Focuses on planning care, psychiatric treatment modalities, and management issues. Explores therapeutic approaches pertinent to selected psychiatric disorders from the DSM-III-R, emergency intervention, and crisis intervention. Uses case material from students' continuing practice in agency as basis for discussion in weekly didactic seminar with faculty. *Prereq.* NUR 3511.

NUR 3513 Psychiatric Nursing Practicum 3 4 QH
Provides clinical experiences with individuals, groups, and families in psychiatric and community settings. Focuses on direct and indirect care, with an increasing emphasis on community involvement in treating mental health problems. Requires assessing a particular community to identify a mental health problem and begin planning a community program. Discusses case studies, interdisciplinary collaboration issues, and intervention strategies from a community mental health perspective in the weekly didactic seminar with faculty. *Prereq.* NUR 3512.

NUR 3514 Psychiatric Nursing Practicum 4 2 QH
Provides a clinical learning experience with groups, families, and organizations in psychiatric and community settings. Requires students to implement and evaluate a community project. Focuses on promotion of mental health and levels of prevention; synthesis of therapeutic techniques in working with complex systems; group process and termination issues related to work with clients, agency, professionals, faculty and student colleagues; and evaluation of clients' progress and students' accomplishments in weekly didactic seminar with faculty. *Prereq.* NUR 3513.

NUR 3520 Crisis Theory and Intervention 3 QH
Addresses crisis theory, practice, and research issues. Reviews and critiques crisis literature. Refines crisis intervention skills and stimulates theory and research development in the crisis intervention field. Includes lectures and discussion of crisis situations from literature, personal and professional experience, and films. Open to graduate students in nursing, criminal justice, applied sciences, and health professions.

NUR 3521 Alcoholism: Assessment and Early Intervention 3 QH
Explores theories and issues related to alcoholism and other addictions. Focuses on skills necessary to assess addictive behavior including taking a client's drug history, working with denial, and making appropriate referrals. Assignments include taking a drinking/drug history and attending a self-help group in the community. Discusses therapeutic issues relevant to professionals in general health care settings.

NUR 3522 Elective Practicum 1 QH
Provides an individualized field experience in an appropriate agency or community setting. Focuses on a selected client population to allow students to observe and practice specific therapeutic skills

supervised by the course instructor. *Prereq.* *Permission of instructor.*

NUR 3524 Psychotherapy Research 2 QH

Provides an analytical approach to understanding the utility and effectiveness of psychotherapy models as psychiatric modalities. Focuses on the process and selected variables that influence psychotherapeutic outcomes. Examines recent studies to determine efficacy of treatment for particular clinical problems and specific client populations. Uses a seminar format. - *Prereq.* *NUR 3501 and NUR 3511 or equiv.*

NUR 3530 Research Practicum 2 QH

Provides an opportunity to work singly or in groups of from two to five students with an experienced researcher in an area related to a clinical specialization or other professional nursing interest. Individual contribution depends on the stage of the research project and is determined jointly by the student, faculty coordinator, and researcher. Includes evaluation of research process and collaboration as well as individual effort. *Prereq.* *NUR 3105.*

NUR 3531 Thesis Advisement 2 QH

Focuses on implementing the research project or thesis on psychiatric-mental health nursing with

assistance from faculty research advisers. Requires data collection, analysis, and presentation of research findings. *Prereq.* *NUR 3105.*

NUR 3540 Psychiatric-Mental Health Directed Study 2 QH

Allows students to develop an individualized plan to attain specific knowledge and skills related to professional goals. Consists of library study or reading, individual instruction, research, practicum, or other appropriate activity. *Prereq.* *Academic adviser's approval.*

NUR 3541 Psychiatric-Mental Health Directed Study 3 QH

Allows student to develop an individualized plan to attain specific knowledge and skills related to professional goals. Consists of library study or reading, individual instruction, research, practicum, or other appropriate activity. *Prereq.* *Academic adviser's approval.*

NUR 3542 Psychiatric-Mental Health Directed Study 4 QH

Allows students to develop an individualized plan to attain specific knowledge and skills related to professional goals. Consists of library study or reading, individual instruction, research, practicum, or other appropriate activity. *Prereq.* *Academic adviser's approval.*

Nursing Administration

NUR 3601 Nursing Administration 1: Health Care Organizations 3 QH

Analyzes administrative theories to prepare student for nursing administration in various health care settings. Focuses on structure, objectives, and policies of health care organizations. Examines the influence of outside groups, health insurers, government, and special interest groups on delivery of health care services. *Prereq.* *NUR 3104.*

NUR 3602 Nursing Administration 2: Finances and Information Systems 3 QH

Presents a theoretical foundation to use and analyze management information systems. Emphasizes the decision making process of fiscal management and allocation of resources. Considers staffing, patient classification systems, reimbursement policies, costing services, and budgeting/fiscal management from entry- to middle-level nursing administrator's perspective. Requires computer exercises with spreadsheets and database management programs. - *Prereq.* *NUR 3601.*

NUR 3603 Nursing Administration 3: Human Resource Management 3 QH

Focuses on professional personnel development and management. Examines department organization, staff development, change, collective bargaining, and quality assurance within the nursing administrator's scope of responsibility. Explores concepts of interpersonal relationships, group dynamics, and consultation to enhance administrative skills. *Prereq.* *Concurrent with NUR 3602.*

NUR 3604 Role Development Seminar 3 QH

Explores the role of the clinical nurse specialist. Focuses on the use of collaboration and change strategies in various practice settings. Includes consultation, education, liaison, supervision, peer review, and referral. Students meet together for seminar and are assigned to integrated specialty groups to focus on issues related to advanced practice in nursing. *Prereq.* *Concurrent with NUR 3601.*

NUR 3611 Nursing Administration Practicum 1 4 QH

Provides an administrative learning experience in a clinical setting with a nursing administrator as preceptor. Applies theory through observing, participating in, and researching organizational functioning and nursing leadership. Focuses on departmental structure and issues related to the role of the nursing administrator in a weekly didactic seminar with faculty. *Prereq.* *Concurrent with NUR 3601.*

NUR 3612 Nursing Administration Practicum 2 4 QH

Provides an administrative learning experience in a clinical setting with a nursing administrator as preceptor. Applies theory through observing, participating, and researching organizational functioning and nursing leadership. Focuses on management and leadership functions and issues related to the role of the nursing administrator in a weekly didactic seminar with faculty. *Prereq.* *NUR 3611.*

NUR 3613 Nursing Administration Practicum 3 4 QH

Provides an administrative learning experience in a clinical setting with a nursing administrator as

preceptor. Applies theory through observing, participating in, and researching organizational functioning and nursing leadership. Focuses on communicating and implementing the role of the nursing administrator in a weekly didactic seminar with faculty. *Prereq.* NUR 3612.

NUR 3620 Nurse Entrepreneur 3 QH

Provides the theoretical foundation for planning and operating a business from the perspective of the nurse entrepreneur. Identifies strategies for achieving business goals. Emphasizes development of a winning business plan through a step-by-step approach with a strong focus on marketing, planning, and financial analysis.

NUR 3630 Research Practicum 2 QH

Provides an opportunity to work singly or in groups with an experienced researcher in a clinical specialization or other professional nursing interest. Individual contribution depends on the stage of the research project and is determined jointly by the student, faculty coordinator, and researcher. Includes evaluation of research process and collaboration as well as individual effort. *Prereq.* NUR 3105.

NUR 3631 Thesis Advisement 2 QH

Focuses on implementing the research project or thesis on nursing administration with assistance from faculty research advisers. Requires data collection and analysis and presentation of research findings. - *Prereq.* NUR 3105.

NUR 3640 Nursing Administration Directed Study 2 QH

Allows students to develop an individualized plan to attain specific knowledge and skills related to professional goals. Consists of library study or reading, individual instruction, research, practicum, or other appropriate activity. *Prereq.* Academic adviser's approval.

NUR 3641 Nursing Administration Directed Study 3 QH

Allows student to develop individualized plan to attain specific knowledge and skills related to professional goals. Consists of library study or reading, individual instruction, research, practicum, or other appropriate activity. *Prereq.* Academic adviser's approval.

NUR 3642 Nursing Administration Directed Study 4 QH

Allows students to develop an individualized plan to attain specific knowledge and skills related to professional goals. Consists of library study or reading, individual instruction, research, practicum, or other appropriate activity. *Prereq.* Academic adviser's approval.

NUR 3798 Master's Thesis Continuation 0 QH

Continued registration while student completes master's thesis or other research project to meet the research requirement in nursing.

Graduate School of Pharmacy and Allied Health Professions

INT 3101 Biochemistry 1**2 QH**

Offers a description of the biochemical components of the cell including carbohydrates, lipids, prostaglandins, steroid hormones, amino acids, polypeptides, proteins, purines, pyrimidines, nucleosides, nucleic acids, and vitamins. Considers buffers, Henderson-Hasselbalch equation, and the importance of pKa. *Prereq.* *One year of organic chemistry.*

INT 3102 Biochemistry 2**2 QH**

Discusses enzymes, enzyme kinetics, and mechanisms of enzyme reactions, of intermediary metabolism and of biological oxidation-reduction reactions, bioenergetics, and the electron transport chain. Considers carbohydrate metabolism including the glycolytic pathway, the citric acid cycle, and the pentose phosphate pathway. *Prereq.* *INT 3101.*

INT 3103 Biochemistry 3**2 QH**

Presents lipid metabolism, including the fatty acid cycle, the biosynthesis of fatty acids, and the biological formation of the prostaglandins, cholesterol, and steroid hormones. Studies the metabolism of the various amino acids, including the urea cycle, one-carbon fragments, transamination reactions, and aromatic hydroxylations. Discusses metabolism of nucleic acids and their building blocks, as well as the genetic basis of protein synthesis, the genetic code, and the mechanisms of control. *Prereq.* *INT 3102.*

INT 3201 Applications of Mass Spectrometry**2 QH**

Examines the principles governing the fragmentation and ionization of organic molecules, the interpretation of mass spectra, and applications of mass spectrometry to the solution of selected problems in the fields of chemistry, biochemistry, and forensic sciences. *Prereq.* *One year of organic chemistry, basic physics, physical organic chemistry desirable but not essential.*

MHP 3101 Health Care Delivery**3 QH**

Explores the principal components of the health care delivery system with an emphasis on its social, political, and economic evolution and development. Discusses future trends and their implications.

MHP 3102 Health Research Methodology**3 QH**

Covers aspects of experimental design and hypothesis testing. Uses critical reading of clinical trials, cohort and retrospective studies, and health services research articles to illustrate principles of research design and conduct. Students will be expected to complete a research protocol. *Prereq.* *MHP 3101.*

MHP 3103 Professional Dynamics in Health Care**3 QH**

Examines skills and techniques used in developing leadership attributes, in creating change, and in working effectively with individuals and groups in the health care environment. Emphasizes differing, successful approaches for both leadership and interaction in the ambulatory, institutional, professional, legislative, and regulatory health care setting. *Prereq.* *MHP 3101 and MHP 3102.*

MHP 3111 Operations Management in Health Care**3 QH**

Studies the application of systems analysis to health care institutions with particular attention to concepts for the management of ancillary services departments. Uses case studies to analyze work sampling, work flow, systems design, materials management, supply utilization, human resource management, and productivity improvements. Requires course project.

MHP 3112 Financial Analysis in Health Care**3 QH**

Focuses on the application of financial analytic principles to health care institutions with particular attention to concepts for the management of ancillary services departments. Uses case studies and hospital financial reports to develop such techniques as cost accounting and budgeting. Emphasizes practical use of financial techniques for analyzing alternatives and decision making, as well as functional knowledge of financial management in health care. *Prereq.* *MHP 3111.*

MHP 3200 Fundamentals of Regulatory Risk Assessment**3 QH**

Applies toxicologic, statistical, and pharmacokinetic principles to assessing the impact on health of hazardous exposure to chemical carcinogens and noncarcinogens found in the environment. Focuses on mathematical methods for quantitative risk assessment, exposure assessment, and risk characterization. Includes lab exercises and term paper assignments for in depth review of the key processes in risk assessment. Uses major risk assessments as examples such as dioxin, ozone, benzene, and ethylene dibromide.

MHP 3201 Biometrics**2 QH**

Explores the fundamental principles of experimental design and statistical analysis, emphasizing biomedical research. Topics include descriptive statistics, hypothesis testing, correlation, regression, and chi-square test.

MHP 3221 Health Science Education 1**3 QH**

Offers an overview of various aspects of education in the health-related professions, including design and use of behavioral objectives, evaluation tools (both clinical and didactic), and a survey of various teaching methods. Discusses current journal literature.

MHP 3222 Health Science Education 2**3 QH**

Examines various packages of self-instructional aids. With the aid of lecture material and independent assignments, each student will design and produce a fifteen-minute autotutorial and will present it to the class for critique. Current journal literature will also be used.

MHP 3401 Health Policy Analysis and Evaluation**3 QH**

Presents the application of analytic techniques (for example, decision analysis, benefit-cost analysis, cost-effectiveness analysis) to the forming, implementing, and evaluating of health policies and health care programs. Analysis of past and present studies in allocation of health care resources will examine the analytic as well as the political basis for decisions. Students critique published case analyses in class.

A written analysis of a future proposal or current program is required. *Prereq.* MHP 3101, MHP 3102, or equiv.

MHP 3402 Health Policy Seminar 1 1 QH
Analyzes a selected topic from health policy literature. Students will be expected to evaluate and critique published articles and lead a seminar session. *Prereq.* MHP 3101 and MHP 3102.

MHP 3403 Health Policy Seminar 2 1 QH
Continues MHP 3402.

MHP 3404 Health Policy Seminar 3 1 QH
Continues MHP 3403.

MHP 3801 MHP Thesis 2 QH
Student may register three times for a total of 6 QH of credit. *Prereq.* Written permission.

MHP 3802 MHP Research Report 2 QH
Student may register for this course three times for a total of 6 quarter hours of credit. *Prereq.* Written permission.

MHP 3810 MHP Directed Study 3 QH
Offers directed research in health studies. Research and study under the direction of a faculty member. *Prereq.* Written permission.

MLS 3301 Functions of the Human Systems 2 QH
Examines physiology of the nervous, endocrine, muscular, cardiovascular, respiratory, urogenital, and digestive systems. *Prereq.* Chemistry and biology.

MLS 3302 Pathophysiology 1 2 QH
Considers disease processes as appropriate and inappropriate variants of normal physiological functions. Examines certain important and illustrative diseases rather than a survey or catalog of diseases in general. *Prereq.* Mammalian physiology; knowledge of biochemistry is helpful.

MLS 3303 Pathophysiology 2 2 QH
Continues MLS 3302. *Prereq.* MLS 3302.

MLS 3304 Cellular Pathology 3 QH
Investigates cell aging and cell death mechanisms; reactions of cells to injury; the effects of ischemia, oxides of nitrogen, ozone, carbon tetrachloride, mercury, cadmium; immune injury; and theories of carcinogenesis. Lectures are based on recent review and current research articles. *Prereq.* Chemistry, biology; biochemistry, and cell biology helpful.

MLS 3310 Principles of Medical Endocrinology 2 QH
Studies endocrine-related clinical abnormalities emphasizing the relationship of clinical lab measurement to biochemical dysfunctions of the endocrine system. *Prereq.* Biochemistry.

MLS 3313 AIDS 2 QH
Offers an exploration of clinical, immunological, virological, epidemiological, and social facets of AIDS. Includes an introductory exposition of the present state of the disease and several sessions critically dissecting the pertinent literature.

MLS 3321 Hematology 1—Disorders of the Erythrocytes 2 QH
Examines the physiology and pathology of red blood cells and hemoglobin. *Prereq.* Some knowledge of basic hematology is essential, and familiarity with general mammalian biochemistry is strongly recommended.

MLS 3322 Hematology 2—Disorders of the Leukocytes 2 QH
Explores the pathophysiology of white cell disorders. Discusses clinical and lab correlations of leukemias, myeloproliferative, and lymphoproliferative disorders, infections, and inherited leukocyte anomalies. *Prereq.* Undergraduate biochemistry.

MLS 3323 Hematology 3—Hemostasis 2 QH
Presents clinical and lab correlations of hemostatic disorders. Covers material from the basic to the most recent experimentation, technical, and clinical applications. *Prereq.* Undergraduate biochemistry, hematology course, or experience.

MLS 3331 Genetic and Immunologic Aspects of Blood Group Identification 1 QH
Offers lectures dealing with immune response, physical chemistry of immunohematological tests, immunological diseases, tests for detection and identification of antibodies and antigens, principles of human genetics, blood group genetics, and population and family studies. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prereq.* MLS 1631 and permission of instructor.

MLS 3332 Principles and Foundations of the Blood Group Systems 2 QH
Presents lectures and experience with the human blood group systems, their antigens and antibodies, genetic inheritance and interactions, frequencies, mutants and alterations by disease states, and blood group testing. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prereq.* MLS 3331, MLS 3531, and permission of instructor.

MLS 3333 Design and Problems of Compatibility Testing 1 QH
Includes lectures and experience with the design and purpose of compatibility testing; factors complicating compatibility procedure; techniques employed in compatibility testing; leukocyte, platelet, and tissue compatibility; and special crossmatch and transfusion procedures. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prereq.* MLS 3331, MLS 3531, MLS 3332, MLS 3532, and permission of instructor.

MLS 3334 Principles of Hematology and Coagulation Related to Transfusion 3 QH
Offers lectures and lab experience related to hemoglobins; iron metabolism; blood formation; blood volume functions of circulating cells; anemias; leukemias and lymphomas; coagulation theories, factors, and disorders. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prereq.* Permission of instructor.

MLS 3335 Transfusion Therapy**2 QH**

Presents lectures discussing the selection of blood donors, phlebotomy and pheresis procedures, processing requirements, donor reaction, blood components, and physical characteristics of stored blood. Topics include indications for transfusion, transfusion reaction, therapeutic phlebotomy and pheresis, autologous transfusions, pediatric transfusions, massive blood replacement, extracorporeal perfusion, cardiopulmonary bypass, and dialysis. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prereq.* *MLS 1631 and permission of instructor.*

MLS 3336 Immunohematology Administration**2 QH**

Offers lectures and experience dealing with standards for blood banks and transfusion services (federal, state, AABB); requirements for state, FDA, and NIH (BOB) licensing; the American Blood Commission; and inspection and accreditation donor procurement. Considers interbank blood exchange; organization of blood bank and transfusion service; medical and legal aspects of transfusion practice; design of physical facilities; and evaluation, selection, and maintenance of equipment. Other topics include evaluation and selection of supplies and reagents; preparation; labeling requirements; quality control systems; proficiency testing programs; record keeping; computer principles, use of computer facilities; and operations of donor facilities and blood bank labs. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prereq.* *MLS 1631 and permission of instructor.*

MLS 3338 Immunobiology**2 QH**

Presents topics of current interest in immunobiology, such as cell interactions in the immune response, the major histocompatibility complex, antibody structure and function and the regulation of the immune response. *Prereq.* *Permission of instructor.*

MLS 3339 Immunopathology**2 QH**

Presents the basic elements of immunopathology. Reviews the components and function of the immune system. Covers the disorders of the complement system, the biologic mechanisms of immunologically induced tissue injury (hypersensitivity reactions), autoimmunity, and immunodeficiency. Considers the immunological features of cancer and transplant rejection. *Prereq.* *MLS 3338.*

MLS 3341 Medical Bacteriology**3 QH**

Focuses on those aspects of clinical bacteriology that are of significance in understanding the interaction among the infecting organism, the host and host defenses that affect symptoms, diagnosis, and chemotherapy of bacterial disease. *Prereq.* *Undergraduate microbiology.*

MLS 3342 Current Topics in Microbiology**3 QH**

Emphasizes current topics in infectious diseases. Discusses topics in microbiology that are of medical and epidemiological interest during the time the course is being offered. *Prereq.* *Undergraduate microbiology and immunology.*

MLS 3343 Medical Virology**3 QH**

Focuses on those aspects of clinical virology that are significant in understanding the interaction among infecting viruses, the host and host defenses that affect symptoms, diagnosis, and therapy of viral disease. *Prereq.* *Undergraduate microbiology and immunology.*

MLS 3345 Epidemiology**2 QH**

Studies the basic concepts of epidemiology, causes of disease, factors contributed by agents, the human host, and the environment. Examines the acquisition and evaluation of data, as well as the relationship of person, time, and place. Reviews case studies and problems, including diet and cancer, causes of heart disease, and a review of the AIDS epidemic. *Prereq.* *Permission of instructor.*

MLS 3351 Interpretive Clinical Chemistry**2 QH**

Presents the basic concepts in lab investigations; diagnostic enzymology, immunology, and clinical toxicology; organ system diseases; metabolic diseases; and special topics such as pediatric clinical biochemistry and cancer-associated biochemical abnormalities. *Prereq.* *INT 3101, INT 3102, INT 3103, undergraduate clinical chemistry, analytical and organic chemistry, and medical physiology.*

MLS 3352 Clinical Chemistry Techniques and Instrumentation**2 QH**

Discusses the current analytical techniques and instrumentation used in clinical and research labs. Emphasizes developing a thorough understanding of the principles of these techniques and instrumentation. Covers applications to specific analyses and instrument troubleshooting. *Prereq.* *INT 3101, INT 3102, INT 3103, MLS 3354 undergraduate clinical chemistry, analytical and organic chemistry, and medical physiology.*

MLS 3353 Clinical Chemistry Quality Assurance**2 QH**

Discusses statistical procedures; establishing and using reference ranges; analyzing goals and clinical relevance of lab procedures; evaluating methods; quality assurance; and sources of biological variation. *Prereq.* *MLS 3352 and biostatistics.*

MLS 3354 Biomedical Analysis**2 QH**

Presents the modern reagents and techniques important in purifying and detecting biomolecules. Examples of reagents are radioisotopes, lumiphores, fluorophores, enzymes, electrophores, monoclonal antibodies, DNA probes, protein A, avidin-biotin, and detergents. Examples of techniques are chromatography, including GC and HPLC, radioenzymatic assays, 2D-electrophoresis, immunoassays, blotting assays, and mass spectrometry. *Prereq.* *INT 3101, INT 3102, and INT 3103.*

MLS 3355, MLS 3356 Seminar and Report in Clinical Chemistry I, 2**2 QH each**

Offers reports and discussions of current journal articles in clinical chemistry. *Prereq.* *PMC 3301.*

- MLS 3365 Medical Laboratory Management 1 3 QH**
Provides an opportunity for medical technologists to prepare themselves for managerial responsibilities. Introduces the basic skills and knowledge appropriate to the administration of a medical lab rather than specialized functional techniques. The basic objectives of the concentration are: to confront the student with appropriate learning experiences; to increase skills and knowledge in basic disciplines underlying administrative practice; and to develop judgment and skills in problem analysis and decision making in organizations. Discusses supervision, operations, organizations, productivity, human behavior, communications, and personnel management. *Prereq. Medical lab experience or permission of instructor.*
- MLS 3531 Genetic and Immunologic Aspects of Blood Group Identification Laboratory 1 QH**
Offers lab experience with immune response, physical chemistry of immunohematological tests, immunological diseases, tests for detection and identification of antibodies and antigens, principles of human genetics, blood group genetics, and population and family studies. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prereq. MLS 1631 and permission of instructor.*
- MLS 3532 Principles and Foundations of the Blood Group Systems Laboratory 2 QH**
Offers lab experience with human blood systems, antigens and antibodies, genetic inheritance and interactions, frequencies, mutants and alterations by disease states, and blood group testing. Conducted at the New Deaconess Hospital Blood Bank Training Center. *Prereq. MLS 3331, MLS 3531, and permission of instructor.*
- MLS 3533 Design and Problems of Compatibility Testing Laboratory 2 QH**
Presents lab experience with the design and purpose of compatibility testing; factors complicating compatibility procedures; techniques employed in compatibility testing; leukocyte, platelet and tissue compatibility; and special crossmatch and transfusion procedures. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prereq. MLS 3331, MLS 3531, MLS 3332, MLS 3532, and permission of instructor.*
- MLS 3535 Transfusion Therapy Laboratory 2 QH**
Provides lab experience with selection of blood donors, phlebotomy and pheresis procedures, processing requirements, donor reaction, blood components, and physical characteristics of stored blood. Topics include indications for transfusion, transfusion reactions, therapeutic phlebotomy and pheresis, autologous transfusions, cardiopulmonary bypass, and dialysis. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prereq. MLS 1631 and permission of instructor.*
- MLS 3536 Immunohematology Administration Laboratory 2 QH**
Offers lab experience with standards for blood banks and transfusion services (federal, state, AABB); requirements for state, FDA, and NIH (BOB) licensing; the American Blood Commission; inspection and accreditation donor procurement; and interbank blood exchange. Topics include organization of blood bank and transfusion service; medical and legal aspects of transfusion practice; design and physical facilities; evaluation, selection, and maintenance of equipment; evaluation and selection of supplies and reagents; preparation; labeling requirements; quality control systems; proficiency testing programs; record keeping; computer principles, and the use of computer facilities; operations of donor facilities; and blood bank labs. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prereq. MLS 1631 and permission of instructor.*
- MLS 3538 Immunobiology Laboratory 2 QH**
Students are required to undertake individual research projects relating to topics covered in lecture.
- MLS 3602 Blood Banking—MLS Seminar 1 QH**
Revolving topics.
- MLS 3603 Clinical Chemistry—MLS Seminar 1 QH**
Discusses current research.
- MLS 3604 Hematology—MLS Seminar 1 QH**
Revolving topics.
- MLS 3605 Immunology—MLS Seminar 1 QH**
Revolving topics.
- MLS 3606 Management—MLS Seminar 1 QH**
Revolving topics.
- MLS 3607 Microbiology—MLS Seminar 1 QH**
Revolving topics.
- MLS 3608 Education—MLS Seminar 1 QH**
Revolving topics. *Prereq. MLS 3221 and MLS 3222, or permission.*
- MLS 3609 Immunohematology—MLS Seminar 1 QH**
Revolving topics.
- MLS 3801 Graduate Research Report 1 2 QH**
Studies a special topic in medical lab science, involving individual research, undertaken and reported under the direction of a faculty member. *Prereq. Written permission of instructor.*
- MLS 3802 Graduate Research Report 2 2 QH**
Students may register twice (4 QH). Continues MLS 3801. *Prereq. MLS 3801.*
- MLS 3821 MLS Thesis 2 QH**
Involves analytical or experimental work conducted under the auspices of the department. Students may register three times (6 QH). *Prereq. Written permission of instructor.*
- PAH 3101 Principles of Medicine 1 6 QH**
Offers an intensive, three quarter, organ-system based sequence encompassing anatomy, physiology, pathophysiology, and therapy of disease. (This course

is the major component of the second-year curriculum of the Tufts School of Medicine and meets for approximately eighteen hours per week). *Prereq.*

Admission to PharmD Program.

PAH 3102 Principles of Medicine 2 6 QH
Continues PAH3101. *Prereq.* PAH 3101.

PAH 3103 Principles of Medicine 3 6 QH
Continues PAH3102. *Prereq.* PAH 3102.

PAH 3201 Drug Literature Evaluation 2 QH
Examines the principles and practice of drug information, literature retrieval, and evaluation of the pharmacy and medical literature. *Prereq.* Admission to PharmD Program.

PAH 3211, PAH 3212, PAH 3213 2 QH each
Pharmacotherapeutics 1, 2, 3
Offers a three quarter sequence in advanced contemporary therapeutics of disease. Topics parallel material presented in the principles of medicine sequence. *Prereq.* Admission to PharmD Program.

PAH 3221 Psychosocial Aspects of Health Care Seminar 1 QH
Studies psychological and social concerns that determine patient behavior and impact on health care. *Prereq.* Admission to PharmD Program.

PAH 3231 Pharmacokinetics in Drug Therapy 3 QH
Examines the application of clinical pharmacokinetic information and techniques to patient care. Discusses the strategies of therapeutic drug monitoring for various drug categories and the use of decision analytic techniques in pharmacokinetic consultations. *Prereq.* Admission to PharmD Program or permission of instructor.

PAH 3311 4 QH
PAH 3312, PAH 3313, PAH 3314 5 QH each
Clerkship 1, 2, 3, 4

Offers a four quarter sequence of advanced clinical clerkship rotations in patient care at various affiliated clinical sites. Students participate in "rounding" activities with medical and other health professionals and have the opportunity to provide drug information in the therapeutic decision-making process. The emphasis in these rotations is on helping students develop skills and familiarity with the application of drugs in the clinical setting as well as the usual progression of disease. Rotations include internal medicine, ambulatory care, and elective experiences. Involves approximately forty hours per week. *Prereq.* Admission to PharmD Program.

PAH 3321 Patient Assessment 2 QH
Explores the general principles of history taking and physical examination. Focuses on organ systems of particular importance to the clinical pharmacist in monitoring drug response. *Prereq.* Admission to PharmD Program.

PAH 3601, PAH 3602 Seminar 1, 2 1 QH each
Offers a two quarter sequence covering topics of relevance to the clinical pharmacy practitioner. Principles of effective communication and teaching are

discussed. Students are expected to make oral presentations covering various therapeutic and related subjects as well as the progress of their investigational projects. *Prereq.* Admission to the PharmD Program.

PAH 3643 Biomedical Science Research Report 1 2 QH
Requires students to present and participate in research group-related seminars, the format of which will be determined by students' advisers. *Prereq.* Doctoral students only.

PAH 3644 Biomedical Science Research Report 2 2 QH
Continues PAH3643. *Prereq.* PAH 3643.

PAH 3645 Biomedical Science Research Report 3 2 QH
Continues PAH3644. *Prereq.* PAH 3644.

PAH 3646 Biomedical Science Research Report 4 2 QH
Continues PAH3645. *Prereq.* PAH 3645.

PAH 3647 Biomedical Science Research Report 5 2 QH
Continues PAH3646. *Prereq.* PAH 3646.

PAH 3648 Colloquium Presentation 1 QH
Requires students to present one formal seminar on their research. This presentation will be open to all those interested. *Prereq.* Doctoral students only.

PAH 3701 Human Nutrition 3 QH
Studies nutrients considered essential for optimal human nutrition. Examines the digestion, absorption, metabolism, and excretion of each nutrient. Discusses food sources recommended, intakes for normal individuals, deficiency, and toxicity syndrome of public health interest.

PAH 3705 Nutrition Seminar 1 QH
Aids the student in developing critical thinking regarding nutrition issues that are important to today's consumer. Introduces the student to a variety of readings that present varying viewpoints about nutrition issues and discusses these issues.

PAH 3707 Experimental Design and Biometrics 3 QH
Discusses fundamental principles of experimental design and statistical analysis, with particular emphasis on clinical research. Topics include descriptive statistics, hypothesis testing, analysis of variance, correlation, regression, chi-square test, and nonparametric methods.

PAH 3731 New Computers for Health Care 3 QH
Introduces computer applications and management of computer applications in health care. Applies the principles of information flow or clinical patient data to the information system lifecycle, emphasizing systems analysis process applied to health care application selection, implementation, evaluation, and monitoring. Analyzes representative applications in different health care disciplines and stresses the manager's role.

PAH 3799 Dissertation Continuation 0 QH
Continues PAH3813. *Prereq.* PAH 3813 must be taken three times before registering for this course.

PAH 3801 Investigational Project 2 QH each
Offers the opportunity to demonstrate the ability to identify a problem within the domain of clinical

pharmacy, formulate a hypothesis, develop methods to collect and interpret the data in order to test the hypothesis, and report the investigation in writing using a thesis format. (Note "Investigational Component of PharmD Program.") *Prereq.* Admission to PharmD Program.

PAH 3804 Investigational Project Continuation 1 QH
Prereq. PAH 3801.

PAH 3805 Independent Study PharmD 3 QH
Prereq. Written permission of instructor.

PAH 3813 Dissertation 3 QH
Prereq. Written consent.

PCL 3101 Concepts in Pharmacology 2 QH
Offers in-depth coverage of the fundamental principles of pharmacology. Covers pharmacodynamics, including dose-effect relationships and drug-receptor interactions. Presents pharmacokinetic concepts, including absorption, distribution, and elimination as well as common pathways of drug metabolism. Other topics include pharmacogenetics, drug resistance, tolerance, and physical dependence. Provides an overview of the drug discovery and development process. The course is a necessary prerequisite for succeeding courses in pharmacology and toxicology. *Prereq.* Admission to a graduate department or permission of the instructor.

PCL 3121 Experimental Pharmacology 2 QH
Offers a lab experience with experimental pharmacology involving whole animal, isolated tissues, and drug receptors to demonstrate classical research methodologies. *Prereq.* PCL 3101, PCL 3153, and admission to Pharmacology or Toxicology programs, or permission of Pharmacology Program director.

PCL 3131 Receptor Pharmacology 2 QH
Reviews receptors for drug substances and for endogenous ligands in a format that combines lecture presentations and discussion. Focuses on the evaluation of current literature. Covers techniques available to study receptors; various models for receptor-ligand interaction; stereochemical aspects of receptor interactions; receptor-mediated coupling mechanisms; and evaluation of several specific receptor systems. *Prereq.* MLS 3301, PCL 3101, INT 3101, INT 3102, INT 3103, or permission of instructor.

PCL 3141 Pharmacology of Drug Dependence 2 QH
Surveys the major drug classes subject to misuse and addiction. Emphasizes general concepts of tolerance and dependence, the general pharmacology of prototypes of abused drugs, patterns and consequences of abuse in humans, and recent research advances. Examines selected research papers critically to stimulate quantitative pharmacologic thinking. *Prereq.* PCL 3101.

PCL 3153 Pharmacological Basis of Therapeutics 1 2 QH
Surveys the chemical and pharmacological basis of the major classes and characteristics of a prototype drug from each class. Characteristics studied include indications, adverse reactions, contraindications, structure-activity relationships, metabolism,

mechanisms of action, and clinically significant interactions. Reading assignments cover animal models relevant to therapeutic screening and/or testing and the appropriate design of clinical trials. *Prereq.* PCL 3101.

PCL 3154 Pharmacological Basis of Therapeutics 2 2 QH
Continues PCL 3153. *Prereq.* PCL 3153.

PCL 3155 Pharmacological Basis of Therapeutics 3 2 QH
Continues PCL 3154. *Prereq.* PCL 3154.

PCL 3301 Pathology 2 QH
Introduces the study of the nature of disease, emphasizing the general mechanisms and pathogenesis. Of paramount importance is the effect of disease on the human body. The language of disease is stressed. Basic principles of disease processes and more common special diseases are extensively covered. A research paper may be assigned at the discretion of the instructor. *Prereq.* anatomy and physiology.

PCL 3601 Pharmacology Seminar 1 QH
Provides the opportunity for students to gain experience in oral and written presentation and in interpreting pharmacological data. Offers topics from current pharmacology literature selected by participants. *Prereq.* PCL 3101.

PCL 3801 Pharmacologic Methods 1 3 QH
Students carry out experiments in the lab of a pharmacology or toxicology faculty member. The experiments serve to demonstrate the techniques utilized in that lab to study a pharmacologic question. *Prereq.* PhD students only.

PCL 3802 Pharmacologic Methods 2 3 QH
Continues PCL 3801. *Prereq.* PCL 3801.

PCL 3811 Research Report in Pharmacology 1 2 QH
Offers a selected research project undertaken by the student under the direction of a faculty member. *Prereq.* PCL 3101.

PCL 3812 Research Report in Pharmacology 2 2 QH
Continues PCL 3811. *Prereq.* PCL 3811.

PCL 3821 Pharmacology Thesis 2 QH
Students may register three times (6 QH). *Prereq.* Written permission from program director.

PCT 3101 Introduction to Biopharmaceutics and Pharmacokinetics 3 QH
Offers the opportunity to students to remedy deficiencies in biopharmaceutics and pharmacokinetics. Topics include general concepts of one and two compartment models; linear and nonlinear pharmacokinetics; drug kinetics after intravenous, intramuscular, or oral administration; practical methods of compartmental models utilizing plasma and/or urinary data; multiple dosing kinetics; bioavailability and bioequivalence of drug products; and effect of renal impairment on drug kinetics. *Prereq.* Permission of instructor.

PCT 3111 Clinical Pharmacokinetics 2 QH
Focuses on applying various pharmacokinetic techniques to estimating dosage regimens, evaluating

drug therapy, consulting on drug selection, and assessing bioavailability and bioequivalence data.

Prereq. A background in biopharmaceutics or permission of instructor.

PCT 3112 Pharmacokinetics **3 QH**

Acquaints graduate students with the theoretical compartmental analysis in pharmacokinetics. Topics include derivation and treatment of general equations for linear and nonlinear mammillary models. Uses of Laplace transform, transfer functions, general partial fraction theorem, and input-disposition functions in pharmacokinetics. Emphasizes practical methods used to kinetically analyze the absorption, distribution, and elimination of drugs. Explores computer methods, physiological models, and stochastic compartmental systems. *Prereq.* MTH 1245, MTH 1246, graduate standing, and permission of instructor.

PCT 3161 Drug Metabolism **2 QH**

Presents the current principles and methods for studying the metabolic transformation and physiological disposition of drugs and other chemicals of pharmacological and toxicological interest. Covers the chemistry of Phase I and Phase II reactions from a mechanistic and empirical viewpoint. Assesses the role of structure, bonding, molecular configuration, substitution, and related physiochemical factors in the enzymatic reactions, as well as the effects of enzyme induction and other factors in the enzymatic reaction. Explores the effects of enzyme induction and other factors such as species, sex, and age on the extent of metabolism. *Prereq.* PCL 3010 or permission of instructor.

PCT 3200 Advanced Pharmaceutics **2 QH**

Studies the theoretical principles of modern physical pharmacy. Emphasizes physical insight and mathematical rigour. Topics include application of basic principles of thermodynamics, colligative properties, colloidal systems, molecular and micellar association, surface chemistry, mass transport phenomena, and chemical stability of drugs. *Prereq.* PCT 1340, PCT 1350, or permission of instructor.

PCT 3205 Novel Drug Delivery System **2 QH**

Conventional use of drugs in the treatment of prevention of disease can be hampered by their indiscriminate action, often leading to side effects. In addition, many drugs are unable to reach target areas in the body in effective concentrations, while others are prematurely excreted or inactivated. During the last decade there have been concerted attempts to circumvent such problems by the use of delivery systems that transport drugs safely to sites when they are needed, and facilitate and/or control their release. This class attempts an in-depth examination of the methodology and significance of these novel delivery systems. Topics include the following systems that are currently under investigation: nanoparticles, cellular vectors, microcapsules, microspheres, prodrugs, liposomes as drug carriers, polymeric systems, and macromolecular systems such as DNA, glycoproteins, monoclonal antibodies, and hormones. *Prereq.* PCT 3101, PCT 3200 or permission of instructor.

PHP 3101 Hospital Pharmacy Administration 1 **3 QH**

Studies management of a department's personnel and financial resources. Covers management skills, personnel administration and organization, as well as budget preparation, analysis, and control, and hospital reimbursement.

PHP 3102 Hospital Pharmacy Administration 2 **3 QH**

Presents an overview of hospital pharmacy services and an introduction of areas of the hospital that either require or relate to pharmacy services. Discusses hospital administration, materials management, quality assurance programs, committee responsibilities, and drug distribution systems, as is the development and writing of a proposal for new services.

PHP 3121 Health Care Administration 1 **3 QH**

Examines the socioeconomics and statistics of health care, including governmental programs, legislative trends, third-party insurance and welfare programs, and other areas that may affect the management of the modern institutional pharmacy. *Prereq.* Admission to the hospital pharmacy program or permission of instructor.

PHP 3131 Computer Applications in Hospital Pharmacy **3 QH**

Reviews past, present, and future applications of computer systems in institutional practice. Covers management aspects of computer systems development and selection. Discusses microcomputers and departmental computers to support clinical and management practice.

PHP 3141 Legal Aspects/Federal Legislation in Pharmacy **2 QH**

Analyzes the federal and state laws relating to the distribution of drugs in the institution. Topics include common-law liabilities such as malpractice and other frequently encountered problems. *Prereq.* Admission to hospital pharmacy program.

PHP 3165 Special Topics in Hospital Pharmacy **2 QH**

Selected topics of interest to hospital pharmacy practitioners.

PHP 3201 Clinical Pharmacy **3 QH**

Considers the patient-oriented aspects of the application of therapeutic agents to hospital patients. Studies the relation of therapeutic regimens to lab tests and drug interactions, as well as the role of the hospital pharmacist as an active member of the health-care team dealing directly with inpatients and outpatients. *Prereq.* Admission to hospital pharmacy program or permission of instructor.

PHP 3211 Contemporary Therapeutics 1 **3 QH**

Explores recent developments in current therapeutic approaches and their rationale in the treatment of cardiovascular, neurological, gastrointestinal, musculoskeletal, and metabolic diseases of a noninfectious nature. Discusses therapy related to aging and selected genetic diseases. *Prereq.* PHP 3201.

PHP 3212 Contemporary Therapeutics 2 **3 QH**

Examines current concepts of infectious diseases and the rationale for the chemotherapeutic treatment

of these conditions. Studies diseases of the blood and blood-forming organs, neoplastic disease, and diseases related to deficiency states. *Prereq.* PHP 3201.

PHP 3231 Drug Monitoring 3 QH

Presents the process by which drugs are monitored to determine their effectiveness, safety, prevention of iatrogenic factors, drug-drug interactions, and matters affecting patient compliance with a therapeutic regimen. Considers the utilization of this information in improving patient care. *Prereq.* *Written permission.*

PHP 3241 Sterile Products 3 QH

Studies theory principles, methods, and techniques in preparing sterile, pyrogen- and particulate-free products. Discusses equipment and lab design required for manufacturing different types of sterile products and the practical considerations essential for their production. *Prereq.* *Permission of instructor.*

PHP 3601 Seminar on Hospital Pharmacy 3 QH

Offers a seminar on current developments or specific problems in hospital pharmacy that have been studied in-depth by students with guidance from the graduate faculty. The student presentations may be alternated with guest speakers on topics of current interest. Student participation in the discussions is an essential objective of the course. *Prereq.* *Admission to hospital pharmacy program.*

PHP 3801 Hospital Pharmacy Thesis 2 QH

Students may register three times (6 QH). *Prereq.* *Written permission of instructor.*

PMC 3101 Chemistry of CNS Depressants 3 QH

Presents and discusses the chemistry, mechanism of action, and structure-activity relationships of general anesthetics, hypnotics and sedatives, anti-epileptics, analgesics, tranquilizers, and muscle relaxants. Considers the mechanics of drug design and methods of modification. *Prereq.* *PMC 3105 or permission of instructor.*

PMC 3102 Chemistry of Autonomic Drugs 3 QH

Discusses drug action on the central nervous system, emphasizing the action mechanism of the chemical mediators of the peripheral nervous system. Considers the role of the agents affecting this system—adrenergic and cholinergic and reversible and irreversible inhibitors of these systems—in relation to their chemical structure and biological activity. *Prereq.* *PMC 3105 or permission of instructor.*

PMC 3103 Chemistry of Anti-Infectives 3 QH

Studies the organic medicinal chemistry of various chemotherapeutic agents used to treat infectious diseases. Focuses on chemistry, mechanism of action, structure activity relationships, and recent research. Topics include antibacterials (sulfonamides, antifolates, and quinolones), antibiotics (beta-lactams, aminoglycosides, and tetracyclines), antivirals, and investigational drugs used in HIV infection therapy. *Prereq.* *PMC 3105 and biochemistry or permission of instructor.*

PMC 3104 Biochemical and Pharmacological Principles of Cancer Chemotherapy 3 QH

Presents recent developments in new approaches to the treatment of cancer, including alkylating agents, antimetabolites, hormones, miscellaneous compounds, and combinations of the above with radiation and immunology. Explores possible mechanisms of chemotherapeutic action. *Prereq.* *PMC 3105 or permission of instructor.*

PMC 3105 Principles of Medicinal Chemistry 3 QH

Presents fundamental chemical and stereochemical principles that account for properties of drugs and contribute to an understanding of drug action. Focuses on the physicochemical properties of functional groups as they relate to overall properties of drug molecules. Topics include delivery of drugs to the central nervous system in terms of lipophilicity/hydrophilicity, ionization potential and hydrogen-bonding capability; the interaction of drugs with neurotransmitter, hormonal, and neurohormonal systems; qualitative and quantitative structure activity relationships; drug biotransformation; and principles of and recent developments in drug design.

PMC 3171 Heterocyclic Drugs in Medicinal Chemistry 3 QH

Studies the application of the combined principles of medicinal and heterocyclic chemistry to the synthesis of pharmaceutically useful compounds. Emphasizes a critical evaluation of the literature methods with respect to synthesis and biological activity. *Prereq.* *Advanced organic chemistry or permission of instructor.*

PMC 3511 Advanced Drug Synthesis 4 QH

Presents the application of synthetic and analytical techniques to the preparation of biologically active compounds and their intermediates. Demonstrates the process of drug development from design to synthesis to final characterization. Includes laboratory documentation and report preparation.

PMC 3601 Medicinal Chemistry Seminar 1 QH

Reports and discussions involving current journal articles and research in medicinal chemistry. *Prereq.* *PMC 3101.*

RSC 3201 Radiopharmaceutical Chemistry 3 QH

Discusses the application of chemistry to the design and synthesis of radiodiagnostic agents. Presents the properties of the radionuclides and their biological carriers as they relate to their uses in nuclear medicine. *Prereq.* *PMC 3105 or permission of instructor.*

RSC 3811 Radiopharmaceutical Chemistry Research Report 1 2 QH

Provides the student with a selected research project related to radiopharmaceutical chemistry under the supervision of a faculty member. Involves a laboratory project or an extensive literature review of topic of current interest in the field.

TOX 3101 Concepts in Toxicology 1 3 QH

Presents the principles of toxicology from an organ system perspective. Focuses on the concepts used to evaluate toxicity; the mode of injury at the organ and

cellular level; and the basic subcellular mechanisms through which toxic agents produce damaging effects. Uses recent toxicological literature to introduce concepts for evaluating toxicity through data analysis.

TOX 3102 Concepts in Toxicology 2 3 QH

Continues TOX 3101. Emphasizes the interpretation of toxicological literature to evaluate the risk involved in exposure to prototype chemicals. Employs structure activity and biochemical methods of assessment to evaluate the toxicity of major classes of chemical compounds.

TOX 3121 Environmental Toxicology 3 QH

Discusses the distribution, interaction, and effects of toxic agents on the biosphere. Examines pollutants grouped by chemical and use characteristics including pesticides, food additives, metals, carcinogens, and teratogens. Addresses the action mechanism and selectivity basis of toxic agents. Applies the results of toxicologic investigation to understanding the environment's chemical pollution.

TOX 3501 Biochemical Toxicology Laboratory 4 QH

Introduces investigative methods for assessing toxicity. Develops the ability to analyze and interpret data generated in lab and in the literature, and sharpens technical report writing skills.

Physician Assistant

The Physician Assistant Program is a post-baccalaureate certificate program. Most of the courses are available to physician assistant students only. Other students interested in enrolling in physician assistant courses must have the permission of the Physician Assistant Program's director.

MLS 1109 Foundations of Medical Laboratory Science 4 QH

Introduces basic lab methods employed in primary care, including urinalysis, gram staining, hematocrit, hemoglobin, sedimentation rate, white-cell count, and differential. Lab. *Prereq. PA students only.*

PA 1120 Roles, Rules, and Resources for Physician Assistants 2 QH

Examines the role of physician assistants, including the manner in which they interact with other health professionals, as well as the way in which their role is perceived by others. Provides an understanding of the law as it relates to physician assistants' actions and to help them develop the ability to make referrals to common community resources. *Prereq. PA students only.*

PA 1125 Human Anatomy 2 QH

Considers the basic structure of the human body, highlighting those features which are of clinical importance. Emphasizes the gastrointestinal, cardiovascular, respiratory, neurological, and musculoskeletal systems. *Prereq. PA students only.*

PA 1133 Physical Diagnosis I 5 QH

Presents techniques for taking an accurate history and performing a physical examination as well as organizing the results for oral and written presentation. Includes discussion, demonstrations, and patient workups. *Prereq. PA students only.*

PA 1134 Physical Diagnosis 2 5 QH

Explores techniques of obtaining and presenting an accurate history; performing a competent and thorough physical examination; and synthesizing the results of the history, physical, and laboratory findings to arrive at an accurate evaluation of the patient. Uses discussion, demonstrations, and patient workups. *Prereq. PA students only.*

PA 1138 Medical Physiology 1 4 QH

Covers principles of gastrointestinal, respiratory, endocrine, and cardiovascular human physiology. *Prereq. PA students only.*

PA 1140 Medical Physiology 2 2 QH

Discusses principles of cardiovascular and renal physiology. *Prereq. PA students only.*

PA 1321 Patient Education and Counseling 2 QH

Provides an opportunity to acquire the knowledge necessary for educating and counseling patients. Demonstrates ways in which to evaluate patients' needs and readiness to learn, as well as the use of common teaching techniques for issues such as chronic disease management, ostomies, diabetes, heart disease, nutrition counseling, and sex education. *Prereq. PA students only.*

PA 1322 Medical Care and Current Social Problems 2 QH

Studies the principal components of the health care delivery system, with emphasis on services, organization, and funding. Uses selected social problems to demonstrate the operation of the medical care system. *Prereq. PA students only.*

PA 1323 Principles and Concepts of Emergency Medicine 3 QH

Introduces the principles of life-support techniques. Focuses on the initial management of acute medical and traumatic conditions in hospital and prehospital situations. Students are instructed in basic cardiopulmonary resuscitation techniques. *Prereq. PA students only.*

PA 1335 Principles of Interviewing 2 QH

Examines various methods of interviewing patients. Focuses on establishing a relationship and understanding the effects of cultural background and psychosocial problems on the patient's response to illness and death and dying. *Prereq. PA students only.*

PA 1336 Pathophysiology and Medicine 1 3 QH

Presents a systems approach to the principles of disease processes in people. Topics include physiology, pathophysiology, the natural history of disease, diagnostic procedure, and therapeutic measures. Hematology and cardiology problems are usually covered. *Prereq. PA students only.*

PA 1337 Pathophysiology and Medicine 2 3 QH

Continues PA 1336. Covers topics that may include pulmonary, infectious disease, gastrointestinal, and endocrine problems. *Prereq. PA students only.*

PA 1338 Pathophysiology and Medicine 3 3 QH

Continues PA 1337. Topics may include renal, rheumatology, oncology, and primary care problems. *Prereq. PA students only.*

PA 1340 Introduction to Clinical Rotations 4 QH

Offers clinical rotations, expectations, and requirements for students about to enter their clinical year. Some review of history taking and physical examination skills is conducted, and students are instructed in various clinical procedures. *Prereq. PA students only.*

PA 1341 Applied Study in Emergency Medicine 4 QH

During this rotation, the student has the opportunity to become familiar with the problems encountered in an emergency room. The student is responsible for taking medical histories and performing physical examinations on acute as well as nonemergent patients and presenting these to the medical preceptor. When appropriate, the necessary diagnostic and therapeutic measures are performed. Through didactic sessions at the clinical site as well as clinical training, the student may also be exposed to the emergency management and treatment of conditions such as trauma, shock, burns, asthma, poisoning, allergic reactions, seizures, and respiratory failure. *Prereq. Successful completion of first year of Physician Assistant Program.*

PA 1342 Applied Study in Medicine 4 QH

Offers the student opportunity to take and record histories and perform physical examinations during in-hospital rotation. Provides the opportunity to become versed in the assessing and managing a variety of medical problems by attending medical rounds and conferences, performing diagnostic procedures, presenting case write-ups, recording progress notes, and working under the supervision of a doctor of medicine. Emphasis is placed on the skills of collecting, assessing, and presenting patient data for physician review; ordering appropriate laboratory and diagnostic studies; counseling patients in therapeutic procedures; and helping to coordinate the contributions of other health professionals in the management of the patient. *Prereq. Successful completion of first year of Physician Assistant Program.*

PA 1343 Applied Study in Pediatrics 4 QH

During the pediatric rotation, the student may develop familiarity with outpatient pediatric problems through training in clinics and private pediatric offices. Emphasis during this training is on caring for the child from birth through adolescence. Students

are given the opportunity to take histories and perform pediatric physical examinations. Diagnosis and management of common childhood illnesses and evaluation of the variations of growth and development are also stressed. Students have the opportunity to develop skills with which to counsel parents on immunizations, child visits, parameters of growth and development, common psychosocial problems, nutrition, and accident and poisoning prevention. Students may also have the chance to learn how to administer immunizations and do audio and visual screening. *Prereq. Successful completion of first year of Physician Assistant Program.*

PA 1344 Applied Study in Mental Health 4 QH

Offers exposure to a wide variety of psychiatric problems. Clinical settings include wards, clinics, and multiservice centers. Students are expected to perform mental status exams and to do cognitive testing. Emphasis is on recognizing various types of psychiatric problems that require referral to a specialist and managing those problems that can be handled by the nonspecialists. Assists students in furthering their understanding of effective patient interactions and the psychiatric components of health, disease, and disability. *Prereq. Successful completion of first year of Physician Assistant Program.*

PA 1345 Applied Study in Obstetrics and Gynecology 4 QH

Provides students the opportunity to become involved with obstetric and gynecological services provided by teaching hospitals in the Boston area. Emphasizes pre- and post-natal care, monitoring a woman in labor, assisting in deliveries, and developing the skill necessary to deliver a child in an emergency situation. Students have the opportunity to take obstetrical histories and perform obstetrical examinations. While rotating through gynecology, the student is expected to learn how to assess and manage a variety of common gynecological problems and to counsel patients on family planning. *Prereq. Successful completion of first year of Physician Assistant Program.*

PA 1346 Applied Study in Ambulatory Medicine 1 4 QH

Offers exposure to aspects of general medical and family practice with emphasis placed on personalized care of healthy and sick patients. Patient education, counseling, and integration of community services, as well as medical diagnosis and management, are considered a major part of this rotation. *Prereq. Successful completion of first year of Physician Assistant Program.*

PA 1348 Principles of Orthopedics 3 QH

Discusses common orthopedic problems, including those of the hand, knee, shoulder, and back. Examines special problems of acute trauma and the management of uncomplicated orthopedic cases. Additional topics may include techniques of completing an adequate patient history and physical examination of the orthopedic patient. *Prereq. PA students only.*

PA 1353 Principles of Pediatrics 3 QH

Examines physiological and psychological fundamentals of child development. Focuses on the major common pediatric illnesses, their signs, symptoms, and treatment regimens; various types of medications used in pediatrics, their indication and dosage in relation to specific disorders; and the management of pediatric emergencies such as cardiac arrest, anaphylaxis, convulsions, coma, and high fevers. *Prereq. PA students only.*

PA 1354 Principles of Psychiatry 3 QH

Offers an opportunity to understand how to work with patients and families exhibiting psychiatric problems. Topics include psychological growth and development, the effect of social milieu on behavior, the psychological bases of drug and alcohol abuse, and the dynamics of psychosomatic problems. *Prereq. PA students only.*

PA 1355 Principles and Concepts of Surgical Intervention in Disease Processes 3 QH

Studies major and minor surgical conditions, with an emphasis on indications for surgical intervention and pre- and post-operative management in both the ambulatory and inpatient settings. *Prereq. PA students only.*

PA 1356 Basic Diagnostic Radiology 2 QH

Introduces the underlying principles, use, and interpretation of radiographs pertinent to primary care medicine. *Prereq. PA students only.*

PA 1358 Medical Therapeutics 3 QH

A case-study format that involves students in planning the management of common disease states. Used to help students understand the clinical use of common therapeutic agents. *Prereq. PA students only.*

PA 1359 Applied Study in Surgery 4 QH

During this rotation students participate in a variety of surgical patient care responsibilities under the supervision of a surgical resident and/or staff surgeon. The rotation emphasizes general surgery, but the students have an opportunity for varying exposure to other surgical specialties and sub-specialties. Students assist in the initial assessment of the surgical patient, including obtaining an accurate medical history and performing a physical examination. As members of the surgical team, the students are involved in pre-operative management, including patient education and any procedures necessary to prepare the patient for surgery. Students assist the surgeon in the operation room when appropriate and have the opportunity to become familiar with operating room procedures and equipment. Students are also involved in the post-operative evaluation and management of the patient. Students will have the opportunity to attend surgical grand rounds and other surgically oriented educational meetings when available at their rotation sites. *Prereq. Successful completion of first year of Physician Assistant Program.*

PA 1360 Applied Study in Ambulatory Medicine 2 4 QH

During this rotation the students participate in providing health care to the adult outpatient under the supervision of a physician specialist in internal medicine. The students will have the opportunity to become involved in the initial assessment and management of adults with a medical complaint as well as the ongoing assessment and management of patients with established diagnoses. It is anticipated that the student will be exposed to many of the common problems encountered in medical practice, such as hypertension, diabetes, and heart disease. The emphasis is on the assessment and management of both acute and chronic medical problems. *Prereq. Successful completion of first year of Physician Assistant Program.*

PA 1361 Applied Study Elective 4 QH

Offers additional exposure to an area of clinical medicine in which the student has a special interest. Student may choose additional experience in an area covered by required rotations or select a subspecialty such as dermatology, orthopedics, cardiology, geriatrics, etc. All elective rotations are reviewed and must be approved by the clinical coordinator. *Prereq. Successful completion of first year of Physician Assistant Program.*

PA 1362 Principles of Obstetrics 2 QH

Discusses the physiologic changes in pregnancy with nutrition, prenatal care, medical complications, and surgical complications of pregnancy, labor, and delivery. Also covers managing pre- and post-natal periods and diagnosing and treating sexually transmitted diseases. *Prereq. PA students only.*

PA 1363 Principles of Gynecology 2 QH

Studies the anatomy and physiology of the human reproductive system, the methods and effectiveness of contraception, and any contraindications. Also explores the medical indications for abortion and the appropriateness of the various methods of pregnancy termination. Emphasizes the causes, signs, and treatments of common gynecological problems, including the significance of early cancer detection. *Prereq. PA students only.*

PA 1364 Medical Anatomy and Physiology 1 4 QH

Considers the basic structure of the human body, highlighting those of clinical importance. Covers the musculoskeletal, neurologic, cardiovascular, and respiratory systems. *Prereq. PA students only.*

PA 1365 Medical Anatomy and Physiology 2 4 QH

Continues PA 1364. Discusses the gastrointestinal, endocrine, and renal systems. *Prereq. PA students only.*

PA 3101 Clinical Neurology 4 QH

Presents the clinical application of neuroanatomy and neurophysiology. Offers the opportunity to develop an understanding of the normal functioning of the nervous system as well as to develop a clinical approach to the assessment and management of a variety of nervous system disorders and disease states. *Prereq. PA students only.*

PA 3102 Principles of Electrocardiography 4 QH

Examines principles of electrophysiology and its application to electrocardiographic tracing. Topics include recognizing arrhythmias, rate and axis determination, conduction abnormalities, characteristic changes seen in myocardial infarction and ischemia, as well as drug and metabolic effect manifested on the electrocardiogram. *Prereq. PA students only.*

PA 3103 Rehabilitation Medicine 4 QH

Studies techniques of effective planning and decision making for patients with multiple chronic problems. The purposes, techniques, and potential of rehabilitation medicine are also discussed. *Prereq. PA students only.*

PCL 1300 Basic Pharmacology 1 2 QH

Covers the classification, mechanism of action, and uses of a spectrum of therapeutic agents. Emphasizes dose response, side effects, and adverse reactions. *Prereq. PA students only.*

PCL 1301 Basic Pharmacology 2 3 QH

Examines the classification, mechanisms of action, and uses of a broad spectrum of therapeutic agents. Focuses on dose response, side effects, and adverse reactions. *Prereq. PA students only.*

PHL 3265 Issues in Medical Ethics 4 QH

Familiarizes students with various philosophical perspectives in medical ethics, including historical, classical, ethical, and contemporary philosophies related to issues such as abortion, truth telling, genetic control, and the allocation of scarce medical resources. Discusses euthanasia and paternalism, among other topics. *Prereq. PA students only.*

SOC 3226 The Aging Process 3 QH

Studies the socioeconomic and social-psychological consequences of aging from the perspective of health care providers. Focuses on the biological changes entailed in aging and the appropriate medical management of geriatric patients. *Prereq. PA students only.*

Graduate School of Professional Accounting

All courses carry five quarter-hours of credit unless otherwise specified.

ACC 3401 Accounting Problems 1

Accelerates introduction to the basic accounting process and the preparation of general-purpose financial statements. Topics include assets, liabilities, and present value concepts. *Prereq.* *Principles of accounting.* *Completion of a self-instructed, programmed text on basic accounting.*

ACC 3402 Cost Accounting Theory and Problems

Analyzes specialized problems of cost accumulation and cost behavior. Topics include cost-volume-profit analysis, standard costs and budgeting, overhead analysis, and capital budgeting. Stresses costs involved in managerial decision making.

ACC 3404 Accounting Problems 2

Continues ACC 3401, including property and equipment, depreciation, long-term liabilities, stockholders equity, earnings per share, income tax accounting, and other deferrals. *Prereq.* *ACC 3401.*

ACC 3405 Accounting Problems 3

Examines specialized accounting topics such as pensions, leases, accounting changes, statement of changes in financial position, partnerships, and government accounting. *Prereq.* *ACC 3404.*

ACC 3406 Advanced Accounting Problems

Studies business combination, including the purchase and pooling methods. Topics include intercompany profits, indirect and reciprocal holdings, and foreign currency translations. *Prereq.* *ACC 3405.*

ACC 3407 Auditing Theory and Practice

Examines auditing concepts, standards, and procedures. Topics include: the legal and ethical responsibilities of the auditor, statistical sampling, auditing and EDP, audit reports, and audit procedures. Stresses the nature and objectives of auditing. *Prereq.* *ACC 3404.*

ACC 3408 Federal Income Tax Accounting 1 6 QH

Studies the Internal Revenue Code, regulations, revenue rulings, and relevant cases. Emphasizes taxation of individuals, corporations, partnerships, estates and trusts, tax-planning and tax research. *Prereq.* *ACC 3404.*

ACC 3409 Federal Income Tax Accounting 2 3 QH

Continues ACC 3408. Focuses on taxation of corporations, tax planning, and tax research. *Prereq.* *ACC 3408.*

ACC 3413 Contemporary Accounting Theory

Offers a capstone course on the theoretical concepts of accounting, focusing on current accounting concepts, issues, and trends. Examines standards and opinions issued by various accounting organizations.

FIN 3414 Management of Financial Resources

Uses case studies to provide a comprehensive examination of corporate financial management and capital management. Explores the various sources of capital, and discusses financial institutions and securities markets.

HRM 3403 Organizational Behavior

Uses case studies to examine behavior in profit and non-profit organizations. Gives students an opportunity to study and develop skills in behavior management.

MEC 3421 Managerial Economics

3 QH

Explores macroeconomic events that influence the business environment. Applies microeconomic concepts to solve typical business problems.

MGT 3415 Business Law

Examines contracts, partnerships, corporations, agency, commercial paper, sales, and other topics essential for professional development in the business and legal environment.

MGT 3416 Business Policy in a Societal Setting

Uses case studies to focus on business decisions confronting management. Examines policy decisions and their impact on various sectors of society, such as stockholders, customers, suppliers, the public and government.

MKT 3410 Marketing

Examines marketing research, as well as organizational, planning, and control systems. Topics include customer/client analysis, product/service planning, pricing, communications, advertising and sales promotion and distribution management strategies.

MSC 3409 Operations Management

Introduces the organization and management of production systems using case studies. Discusses the three major types of production systems, flow, job, and project, with special emphasis given to capacity, scheduling, inventory, and control.

MSC 3422 Quantitative Analysis 1

3 QH

Studies the process of statistical inference, whereby the analyst infers or draws conclusions about the parameters of a large data set on the basis of sample statistics. Topics include generating subjective probabilities, revising probabilities to incorporate new information, and incorporating probabilities into the decision-making framework.

MSC 3423 Quantitative Analysis 2

3 QH

Introduces the theory and practice of management science. Discusses regression analysis, linear programming, and simulation in text and case material. Emphasizes practical application of the techniques. Considers issues of problem definition, model building, relevant cost determination, solution generation, and implementation of results.

MSC 3425 Information Systems

4 QH

Studies computers and management information systems, focusing on issues relevant to audit and control. Examines basic computer and information systems concepts, including computer hardware, software, and systems development. Emphasizes managing, planning, and controlling computer resources, security and privacy issues, and computer auditing.

Appendix

Academic Calendar 1991–1992

September 1991

2	Monday	Labor Day. University closed.
3–6	Tuesday–Friday	Final examinations for graduate schools.
9–22	Monday–Sunday	Vacation period.
17–18	Tuesday–Wednesday	Fall 1991 registration—Burlington 5:00 PM–7:30 PM.
12	Thursday	Fall commencement.
16–19	Monday–Thursday	Fall 1991 registration—Boston 10:30 AM–7:00 PM.
23	Monday	Beginning of 1991–1992 academic year. Graduate classes begin.

October 1991

14	Monday	Columbus Day. University closed.
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November 1991

11	Monday	Veterans' Day observed. University closed.
28–Dec. 1	Thursday–Sunday	Thanksgiving Day recess.

December 1991

2–5	Monday–Thursday	Winter 1992 registration—Boston 10:30 AM–7:00 PM.
3	Tuesday	Winter 1992 registration—Burlington 5:00 PM–7:30 PM.
9–13	Monday–Friday	Final examination for graduate schools.
16–Jan. 5	Monday–Sunday	Christmas vacation.

January 1992

1	Wednesday	New Year's Day. University closed.
6	Monday	Graduate classes begin.
20	Monday	Martin Luther King, Jr.'s Birthday observed. University closed.

February 1992

17	Monday	Presidents' Day. University closed.
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March 1992

16–19	Manday–Thursday	Spring 1992 registration—Boston 10:30 AM–7:00 PM.
17	Tuesday	Spring 1992 registration—Burlington 5:00 PM–7:30 PM.
23–27	Manday–Friday	Final examinations for graduate schools.

April 1992

6	Monday	Graduate classes begin.
20	Monday	Patriots' Day. University closed.

May 1992

25	Monday	Memorial Day. University closed.
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June 1992

15–16	Manday–Tuesday	Summer 1992 registration—Boston 10:30 AM–7:00 PM.
15–19	Manday–Friday	Final examinations for graduate schools.
16	Tuesday	Summer 1992 registration—Burlington 5:00 PM–7:30 PM.
20	Saturday	Commencement.
22–28	Manday–Sunday	Vacation period.
29	Monday	Graduate classes begin.

July 1992

4	Saturday	Independence Day. University closed.
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September 1992

7	Monday	Labor Day. University closed.
14–27	Manday–Sunday	Vacation period.
17	Thursday	Fall commencement.
28	Monday	Beginning of 1992–1993 academic year.

Calendar dates are subject to change. The University community will be notified if such changes are necessary.

Northeastern University's Mission

Northeastern University's mission, as a large urban university founded on the cooperative model of education, is to provide excellence in education. The University achieves its mission through curricula that value equally knowledge for its own sake, knowledge as a means to success in the workplace, and knowledge as a cornerstone of personal achievement and satisfaction.

Achieving Northeastern University's mission requires excellence in teaching, and teaching remains the central activity of Northeastern's faculty. By offering undergraduate and graduate programs that are rigorous, relevant, and rewarding, the University provides a solid structure for educational excellence. Northeastern University is also committed to the search for knowledge through the scholarly and artistic undertakings of its faculty and students.

A central mandate of Northeastern University is to offer students the opportunity to apply directly lessons of the classroom and laboratory to the workplace through cooperative education. For three quarters of a century, cooperative education has been the keystone of Northeastern's uniqueness. As an increasing percentage of the nation's population enters the workforce, and new technologies continue to change the nature of work, the University has rededicated itself to helping the cooperative plan keep pace with those changes.

Northeastern University is committed to serving the educational needs of a diverse student population in an amenable physical environment. The University believes that its mission can be achieved only if the student body is not limited by economic status, cultural or racial background, geographic origin, sex, or age. Northeastern has a long history of serving the educational needs of the nontraditional student, providing degree and nondegree programs for people whose circumstances prevent them from following the standard college regimen.

Looking beyond the confines of the campus, Northeastern University is determined to maintain and strengthen its reputation as a friend to the City of Boston and a partner of the Commonwealth of Massachusetts. The University's obligation to serve the community of which it is an integral part is fulfilled primarily through the educational enterprise. Through its numerous outreach programs, the University has made striking contributions to the community in the applied social sciences, in high technology, and in the arts. Northeastern University will continue to contribute in these and other ways to the region's overall quality of life and to its economic vitality.

Accreditation

Northeastern University is accredited by the New England Association of Schools and Colleges, Inc., a nongovernmental, nationally recognized organization whose affiliated institutions include elementary schools through collegiate institutions offering

postgraduate instruction. Accreditation of an institution by the New England Association indicates that it meets or exceeds criteria for the assessment of institutional quality periodically applied through a peer group review process. An accredited school or college is one which has available the necessary resources to achieve its stated purposes through appropriate educational programs, is substantially doing so, and gives reasonable evidence that it will continue to do so in the foreseeable future. Institutional integrity is also addressed through accreditation.

Accreditation by the New England Association is not partial but applies to the institution as a whole. As such, it is not a guarantee of the quality of every course or program offered, or the competence of individual graduates. Rather, it provides reasonable assurance about the quality of opportunities available to students who attend the institution.

Inquiries regarding the status of an institution's accreditation by the New England Association should be directed to the administrative staff of the school or college. Individuals may also contact the New England Association of Schools and Colleges, The Sanborn House, 15 High Street, Winchester, Massachusetts 01890, 617-729-6762.

Equal Opportunity Employment Policy

Northeastern University does not discriminate on the basis of race, color, religion, sex, sexual preference, age, national origin, or veteran or handicap status in admission to, access to, treatment in, or employment in its programs and activities.

In addition, Northeastern will not condone any form of sexual harassment. Handbooks containing the University's nondiscrimination policies and its grievance procedures are available in the Office of Affirmative Action, 175 Richards Hall. Inquiries regarding the University's nondiscrimination policies may be directed to Ellen S. Jackson, Dean/Director, Office of Affirmative Action, 175 Richards Hall, Northeastern University, Boston, Massachusetts 02115, 617-437-2133.

Inquiries concerning the application of nondiscrimination policies may also be referred to the Regional Director, Office for Civil Rights, United States Department of Education, J. W. McCormack Building, Post Office Court House, Room 2222, Boston, Massachusetts 02109-4557.

Delivery of Services

The University assumes no liability, and hereby expressly negates the same, for failure to provide or delay in providing educational or related services or facilities or for any other failure or delay in performance arising out of or due to causes beyond the reasonable control of the University, which causes include, without limitation, power failure, fire, strikes by University employees or others, damage by the elements, and acts of public authorities. The University will, however, exert reasonable efforts, when in its judgment it is appropriate to do so, to provide

comparable or substantially equivalent services, facilities, or performance, but its inability or failure to do so shall not subject it to liability.

The Northeastern University Bulletin contains current information regarding the University calendar, admissions, degree requirements, fees, and regulations, and such information is not intended to be and should not be relied upon as a statement of the University's contractual undertakings.

Northeastern University reserves the right in its sole judgment to promulgate and change rules and regulations and to make changes of any nature in its program, calendar, admissions policies, procedures and standards, degree requirements, fees, and academic schedule whenever it is deemed necessary or desirable, including, without limitation, changes in course content, the rescheduling of classes, cancelling of scheduled classes and other academic activities, and requiring or affording alternatives for scheduled classes or other academic activities, in any such case giving such notice as is reasonably practicable under the circumstances.

Northeastern will do its best to make available to you the finest education, the most stimulating atmosphere and the most congenial conditions it can provide. But the quality and the rate of progress of your academic career is in large measure dependent upon your own abilities, commitment, and effort. This is equally true with respect to professional advancement upon completion of the degree or program in which you are enrolled. The University cannot guarantee that you will obtain or succeed at any particular job; that will depend upon your own skills, achievement, presentation, and other factors such as market conditions at that time. Similarly, in many professions and occupations there are increasing requirements imposed by federal and state statutes and regulatory agencies for certification or entry into a particular field. These may change during the period of time when you are at Northeastern, and they may vary from state to state and from country to country. While the University stands ready to help you find out about these requirements and changes, it is your responsibility to initiate the inquiry because the University has no other way of knowing what your expectations and understandings are.

In brief, the University is there to offer you educational opportunities and to assist you in finding the direction in which you want to steer your educational experience. But you are a partner in this venture with an obligation and responsibility to yourself.

Family Educational Rights and Privacy Act

In accordance with the Family Educational Rights and Privacy Act of 1974, Northeastern University permits its students to inspect their records wherever appropriate and to challenge specific parts of them when they feel it is necessary to do so. Specific details of the law as it applies to Northeastern are printed in the Student Handbook and are distributed annually at registrations of the University colleges and graduate schools.

Disability Resource Center

The Disability Resource Center provides a variety of support services and general assistance to all of Northeastern's disabled students and employees. The University's efforts to comply with the Title IX Education Amendments of 1972 and Section 504 of the Rehabilitation Act of 1973 are coordinated by the dean and director of Affirmative Action.

Disclaimer

Tuition rates, all fees, rules and regulations, courses and course content are subject to revision by the President and the Board of Trustees at any time.

Emergency Closing of the University

Northeastern University has made arrangements to notify students, faculty, and staff by radio when it becomes necessary to cancel classes because of extremely inclement weather. AM radio stations WBZ (1030), WEEI (590), WHDH (850), WRKO (680), and FM stations WBCN (104.1), and WROR (98.5) are authorized to announce the University's decision to close. Since instructional television courses originate from live or broadcast facilities at the University, neither the classes nor the courier service operate when the University is closed.

Registration Information

To obtain course listings for the School of Law, please refer to the School of Law catalog.

In order to register for courses outside your graduate school, you *must* meet the requirements of the school offering the course(s) as well as your home school.

Students may not register for any courses outside their school unless the appropriate permit is presented at registration. Consult your graduate school office for details concerning these procedures.

Northeastern University Publications
02.91.16



Northeastern University Undergraduate Bulletin

1991-1992

A photograph of the Snell Library at Northeastern University at night. The building is a multi-story structure with a modern design, featuring large glass windows and concrete pillars. The interior lights are on, and the name "SNELL LIBRARY" is visible on the facade. A bicycle is parked near the entrance steps.

SNELL LIBRARY

Northeastern University

1991–1992

Undergraduate Bulletin

Northeastern University (USPS 989-040) is published by Northeastern University at 360 Huntington Avenue, Boston, Massachusetts 02115, four times a year; once in January, once in August, once in September, and once in October. Second-class postage paid at Boston, Massachusetts, and at additional mailing offices. Volume XIX, Number 2, August 30, 1991.

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Northeastern University
Department of Undergraduate Admissions
360 Huntington Avenue
Boston, Massachusetts 02115

Message from the President

Northeastern University, located in the heart of Boston, is an exciting, vibrant place to pursue a college education. I am proud and delighted to introduce the University to you.

At Northeastern, all our efforts are directed toward the individual student's academic achievement, career development, and social and intellectual growth. We are dedicated to serving students who seek to graduate from college prepared to take their places in a productive economy as well as those who seek a broad foundation for a variety of careers and for intelligent citizenship.

With the nation's increased demand for an educated, well-trained work force, Northeastern prepares people to be productive contributors to their own and to society's economic well-being. At the same time, the University provides students with a broad-based understanding of cultural, moral, and artistic values, because economic well-being alone is insufficient to productive lives and human happiness.

Cooperative education, linking the real world of practical experience with an academy of scholars and teachers, represents Northeastern's distinctive edge. The strength of co-op is its close connection to the world of work and the needs of students.

Northeastern's practical approach to a college education complements the University's emphasis on academic life. We offer a broad spectrum of liberal arts and professional programs taught by a distinguished faculty dedicated to excellence in teaching, innovation in scholarship, and creativity in research.

Each year students graduate from Northeastern with a head start on their careers and a good sense of themselves and their relationship to the community, enhanced and strengthened by new knowledge, new awareness, and new skills that will form the basis of personal achievement and satisfaction in the real world. In providing an environment for individual growth and achievement, the University aims to fulfill its historic mission of offering students the opportunity for upward mobility through educational excellence.

John A. Curry
President

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Academic Calendar 1991–1992

September 1991

2	Monday	Labor Day. University closed.
3–6	Tuesday–Friday	Final examinations for Basic Colleges.
9–18	Monday–Wednesday	Division A vacation.
12	Thursday	Fall Commencement.
16	Monday	Orientation for freshmen and transfer students.
18–20	Wednesday–Friday	Continuation of course advising, course registration, course drop/add periods, and orientation for college day programs.
19	Thursday	Upperclass registration (Division A).
23	Monday	Classes begin in Basic Colleges for fall quarter, 8:00 A.M.

October 1991

14	Monday	Columbus Day. University closed.
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November 1991

11	Monday	Veterans' Day celebrated. University closed.
28–30	Thursday–Saturday	Thanksgiving Day recess.

December 1991

9–13	Monday–Friday	Final examinations for Basic Colleges.
16–Jan. 3	Monday–Friday	Christmas vacation.

January 1992

1	Wednesday	New Year's Day. University closed.
6	Monday	Orientation and registration for new freshmen and transfer students; registration for continuing September freshmen and returning upperclass students.
7	Tuesday	Registration, orientation, and course drop/add continues until noon.
8	Wednesday	Classes begin in Basic Colleges for winter quarter, 8:00 A.M.
20	Monday	Martin Luther King, Jr.'s Birthday observed. University closed.

February 1992

17	Monday	Presidents' Day. University closed.
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March 1992

23-27	Monday-Friday	Final examinations for Basic Colleges.
30-April 4	Monday-Saturday	Division B vacation.

April 1992

6	Monday	Orientation and registration for transfer students, continuing freshmen, and returning upperclass students.
7	Tuesday	Registration, orientation, and course drop/add continues until noon.
8	Wednesday	Classes begin in Basic Colleges for spring quarter, 8:00 A.M.
20	Monday	Patriots' Day. University closed.

May 1992

25	Monday	Memorial Day. University closed.
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June 1992

15-19	Monday-Friday	Final examinations for Basic Colleges.
20	Saturday	Commencement.
22-26	Monday-Saturday	Division A vacation.
29	Monday	Registration for Divisions B and D and January freshmen (quarter three). Beginning of summer quarter.
30	Tuesday	Basic College classes begin for summer quarter, 8:00 A.M.

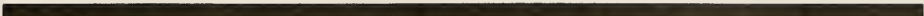
July 1992

4	Saturday	Independence Day. University closed.
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September 1992

7	Monday	Labor Day. University closed.
8-11	Tuesday-Friday	Final examinations for Basic Colleges.
14-23	Monday-Wednesday	Division B vacation.
17	Thursday	Fall Commencement.
21	Monday	Beginning of 1992-93 academic year. Orientation week for new students. Registration and advising week for all returning upperclass students and all new students.
24	Thursday	Upperclass registration (Division B).
28	Monday	Classes begin in Basic Colleges for fall quarter, 8:00 A.M.

Note: If calendar dates change, University personnel will be notified.



The University



History



Located at the center of Boston's thriving educational and cultural life, Northeastern University is dedicated to excellence in research and scholarship and is committed to responding to individual and community educational needs. Since its beginning at the end of the nineteenth century, Northeastern has pioneered a wide range of educational programs and services for students of all ages.

Northeastern University is a private, nonsectarian institution of higher learning chartered and authorized to grant degrees under the General Laws of Massachusetts. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of more than 200 distinguished academic and professional leaders from around the country.

The story of Northeastern's growth constitutes a history of achievement and commitment to the spirit that shaped it. The University traces its roots to 1896, when the Boston YMCA established the Evening Institute for Young Men. Guided by the belief that the opportunity for a quality higher education should be available to all, the Evening Institute aspired to provide programs to address individual and

community educational needs. One of the first steps was to offer evening classes at reasonable cost for those who worked during the day.

On October 3, 1898, the Department of Law of the Evening Institute offered the first program at what was to become Northeastern University. Six years later, the Evening Law School was incorporated with the authority to grant degrees in law.

The 1909 opening of the Cooperative Engineering School, an innovative project of the Evening Institute, exemplified Northeastern's educational philosophy. In one of the earliest cooperative education experiments in the nation, the daytime program alternated classroom study with work experience. The Cooperative Plan of Education has since been expanded and adopted by all ten of the University's Basic Colleges as well as by many of its graduate programs.

In 1917, the newly incorporated Northeastern College of the Boston YMCA—comprising the Evening Law School, the School of Commerce and Finance, the Cooperative Engineering School, the Polytechnic School, and several affiliated schools—chose Frank Palmer Speare as its first president. Five years later, the College was renamed Northeastern University of the Boston YMCA. With the establishment of the College of Business in 1922, the University began acquiring land around Huntington Avenue for its expanding programs. Although Northeastern moved toward financial and administrative independence during the 1920s and early 1930s, it was not until 1935—the same year the College of Liberal Arts was established—that the words “of the Boston YMCA” were dropped from its name.

Carl Stephens Ell succeeded to the presidency in 1940. Three years later, women were first admitted to the day colleges. After World War II, the University continued to grow, accommodating large numbers of veterans under the G.I. Bill and establishing the College of Education.

In 1959, Asa Smallidge Knowles was inaugurated as Northeastern's third president. The next decade marked another period of expansion in the University's programs and facilities. University College was established, offering programs at the Huntington Avenue campus and at several satellite locations to better accommodate the needs of adult, evening, and part-time students.

The merger with the New England College of Pharmacy in 1962 led to the creation of the College of Pharmacy and Allied Health Professions. The University's interest in the health professions was reinforced in 1964 when the College of Nursing was established and Boston-Bouvé College, formerly Tufts University's Bouvé-Boston School, joined Northeastern. The late 1960s saw the founding of the College of Criminal Justice and the reopening of the School of Law.

Kenneth Gilmore Ryder, Northeastern's fourth president, was inaugurated in 1975. The early 1980s witnessed the merger of Boston-Bouvé College and the College of Education to become Boston-Bouvé College of Human Development Professions, the founding of the College of Computer Science, the creation of Network Northeastern (the live telecasting of engineering courses to high-technology corporations in the Boston area), and the development of the Alternative Freshman-Year Program and the University Honors Program.

On July 1, 1989, John Anthony Curry became the first Northeastern graduate to hold the office of University president. Bringing to the position a long history of service to the University, he has focused Northeastern's programs and services even more strongly on cultivating each individual student's academic achievement, career development, and social and intellectual growth. The 1990 opening of a new library, the largest and most up-to-date academic library in Boston, signaled the new president's commitment to academic excellence as Northeastern approaches its centennial year.

The Boston Environment

One out of every five Massachusetts students chooses Northeastern University for his or her college education. In addition to its innovative system of cooperative education, Northeastern offers students access to the educational, cultural, professional, historical, and recreational resources of the Boston area. The University encourages students to explore these opportunities to the fullest.

The home of more than 60 colleges and universities, Greater Boston offers a profusion of academic activity. Within walking distance of Northeastern are the Massachusetts Institute of Technology, Boston University, Simmons College, Emmanuel College, Massachusetts College of Art, and Harvard Medical School. Also close by are Boston's world-renowned hospitals and their affiliated research facilities, where many students fulfill co-op requirements.

Located throughout metropolitan Boston, many of America's leading corporations and institutions provide Northeastern students with meaningful cooperative education experiences. Their offices and laboratories become classrooms for students participating in the world of work firsthand.

Among the hundreds of cultural attractions in Boston are the Museum of Fine Arts and Symphony Hall, both adjacent to the Northeastern campus. The museum provides free admission to its permanent collections and special exhibitions for more than 16,000 Northeastern undergraduates. Also neighbors of Northeastern are the Isabella Stewart Gardner Museum, the Institute of Contemporary Art, the New England Conservatory of Music, and the Boston Public Library. A short ride on mass transit brings students to the Museum of Science, the Hayden Planetarium, the New England Aquarium, and the theatre district. Northeastern's own *nuArts* performance series brings artists from all over the world to campus.

Best known as the birthplace of the American Revolution, Boston attracts thousands to the historical landmarks of its Freedom Trail every year. Among them are Paul Revere's House, the U.S.S. *Constitution* ("Old Ironsides"), Faneuil Hall, Beacon Hill, and the Boston Common. In recent years, a Harborwalk has introduced visitors to sites on the Boston Waterfront, including the Old State House and the Boston Tea Party Ship and Museum.

Boston revels in the competition of its professional sports teams—the Red Sox, Celtics, Bruins, and Patriots—and Northeastern students join in the excitement at Fenway Park, Boston Garden, and Foxboro Stadium. Each spring, the world's best runners gather to participate in the Boston Marathon. In addition, the Charles River and the slopes of northern New England tempt Northeastern students with some of the best crewing and skiing in the country.

The shops and restaurants of Boston's famous Quincy Market typify the city's blend of the historic and contemporary. Boston is the bustle of Haymarket and Chinatown, the grace of the State House and the Public Garden, and the striking architecture of Government Center, Copley Place, and the Christian Science Center. The John Hancock Observatory and the Prudential Skywalk, both a short walk from the Northeastern campus, offer excellent views of the city, old and new.

Campus Highlights

Northeastern University is located in a Boston neighborhood known for its many cultural and educational institutions. Symphony Hall (home of the Boston Symphony Orchestra), Horticultural Hall (home of the Massachusetts Horticultural Society), the New England Conservatory of Music, the Museum of Fine Arts, Simmons College, and the Isabella Stewart Gardner Museum are all nearby. The Fenway area, with its beautiful rose garden, bicycle and jogging paths, and Fenway Park, abuts the campus.

The campus comprises 52 buildings in an area of 55 acres. The buildings are organized in a formal grid, creating a series of landscaped courtyards and open corridor spaces. The vertical lines of the more centrally located buildings are the dominant theme of the campus architecture. A series of interconnecting walkways and secondary streets runs throughout the campus, linking the central academic area and dormitories as well as the athletic facilities and parking areas. A network of underground corridors connects many of the buildings, providing routes that are especially convenient during periods of inclement weather.

The front door to the campus is the Quadrangle, which faces Huntington Avenue, a major thoroughfare that divides the academic buildings in the southern portion of the campus from the dormitories in the north and provides convenient public transportation to downtown Boston and other areas of the city. In addition, the Quad is the location of Blackman Auditorium, site of many lectures and performances, and of the Ell Student Center, home of student clubs, offices, and study areas.

As the University has grown, renovations have been completed and new buildings have been added to the central academic area. The newest of these is the Snell Library, the largest academic library in Boston, which opened in 1990. Parking and recreational areas have been relocated on the periphery of campus.

Cullinane Hall, the University's oldest building, has been completely renovated and now provides a stimulating environment for the College of Computer Science.

Matthews Arena, located on the periphery of the campus, is the oldest indoor ice hockey arena in the United States. With extensive renovations completed in 1983, it is now used for hockey, men's and women's varsity basketball, and community athletics. It supplements the athletic and recreational facilities available to Northeastern students in the newly renovated Cabot-Barletta field house, gymnasium, and swimming pool complex.

Another example of the University's development is the Snell Engineering Center, a building that accommodates the Departments of Industrial Engineering and Information Systems, Civil Engineering, Chemical Engineering, Mechanical Engineering, and the School of Engineering Technology. The Snell Center adjoins the Dana Research Center, home of the departments of Physics and of Electrical and Computer Engineering, creating an impressive academic complex.

Serving as a second entry point to the campus, the relocated Orange Line of the MBTA has two stops convenient to Northeastern—the Massachusetts Avenue and Ruggles Street stations. The Ruggles Street subway station also links local bus routes and a suburban commuter rail line.

Located at this new entrance is Ryder Hall, once a mill. Extensive renovation has provided general classrooms and studio space for the performing and visual arts and has significantly expanded administrative office space. Also in this developing area of the campus is a 995-car parking garage.

During the next five years, the University plans to build a new residence hall for undergraduate students, a recreation center, and additional facilities for engineering and the sciences.

Visitor Information

Hours

Monday–Friday

8:00 A.M.–5:00 P.M.

At the Visitor Information Center, 115 Richards Hall, staff members answer questions, give directions, and provide advice about the University and its programs to visitors, students, staff, and faculty. The University map, *Northeastern University Magazine*, *The Northeastern Voice*, and other Northeastern catalogs and brochures are available.

Visitors to Northeastern may request a University visitor pass entitling them to a number of special services and premiums, including an information kit, discounts at the University Bookstore and University events, complimentary posters, and free passes to the nearby Museum of Fine Arts.

A notary public is available at the center from 8:30 A.M. to 4:30 P.M., Monday through Friday.

For an up-to-the-minute recorded listing of University activities and events of interest to the University community and the general public, telephone the Northeastern University events line at 617-437-3281.

Undergraduate Admissions



Department of Undergraduate Admissions

139 Richards Hall

Boston, MA 02115

Telephone: 617-437-2200

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David G. Lister, M.Ed.

One of the main goals of the college applicant is to find a place finely tailored to personal needs and professional interests. Northeastern University is such a place.

The Committee on Admissions extends a cordial welcome to all prospective freshmen and transfer students and offers several forms of introduction: a campus visit; talking with faculty, students, and alumni; and studying college publications and videos.

The campus visit ranks high on the list of all prospective students, and the University has planned a series of events to make such a visit eminently worthwhile.

■ Information Sessions

Students have many questions about Northeastern—its programs of study, its support services, and the Cooperative Plan of Education. For this reason, the Committee on Admissions sponsors a series of information sessions to better acquaint applicants with the University.

Scheduled at 10:00 A.M. and 2:00 P.M. on Mondays and Fridays from October 1 through June 1 (except for legal holidays) and usually offered throughout school vacation periods, these sessions include presentations by an admissions counselor, an informal question-and-answer period, and a multimedia presentation.

These sessions are also held on Saturday mornings in the fall and spring. For more information, contact the Department of Undergraduate Admissions.

■ The Interview

The Committee on Admissions recommends that all prospective students schedule a personal interview.

The interview provides an opportunity for students to meet with an admissions counselor and to learn more about the University's academic programs and the Cooperative Plan of Education.

Contacts with admissions personnel will be more beneficial if the *Northeastern University Bulletin* has been read carefully before the personal interview.

■ Guided Tours

Student-guided tours of the campus are usually held daily, Monday through Friday, at 11 A.M. and 3:00 P.M. and on Saturday mornings in the fall and spring. During July and August, tours are held on Monday through Thursday. Both the admissions information session and the tour should be scheduled in advance by contacting the Department of Undergraduate Admissions.

The opportunity to visit the University's facilities and to observe student life on campus is one important way to learn about Northeastern. To set up an information session or tour, telephone 617-437-2211.

■ College Visit Program

Prospective students and their parents have the opportunity to visit any one of the basic undergraduate colleges and schools through the College Visit Program. Students are taken on a tour of the facilities to learn firsthand about the college's academic programs by meeting informally with the faculty, administrators, and current students. The College Visit Program is scheduled so that visiting students and their parents may also participate in the information session and University Tour on the same day. For more information, contact the Department of Undergraduate Admissions.

■ **Open Houses**

During late winter and early spring, each of Northeastern's undergraduate colleges invites prospective students and their parents to an Open House. These informal meetings provide an overview of the University and individual colleges. Applicants meet members of the faculty and students to learn more about academic program offerings and to tour the campus and facilities.

Representatives of various University departments provide a variety of information about admissions, cooperative education, financial aid, residential life, student activities, and the University libraries, among other areas. The representatives are happy to answer any questions that students and their parents might have.

■ **College Program Booklets**

The Department of Undergraduate Admissions produces a booklet for each of the undergraduate colleges and schools. Designed to present a comprehensive picture of an individual college, these booklets are a graphic illustration of the University's unique integration of academic study and cooperative education experiences.

Information about academic programs and major areas of concentration, cooperative education opportunities and employers, admissions procedures, University resources and activities, and the campus and Boston environment is provided in these booklets.

■ **Videocassettes**

In addition to providing students with printed material describing Northeastern's academic programs, the Department of Undergraduate Admissions has produced a series of videocassettes that are available to prospective students upon request. The videocassettes offer a general introduction to the University as well as an overview of each of the undergraduate colleges and schools.

Many high schools and junior colleges have a copy of the Northeastern University Introductory Videotape. The University is also a member of the Learning Resources Network. Students are encouraged to consult with their guidance office or career center about the availability of the introductory videotape.

Admission

Northeastern welcomes qualified applicants from across the country and around the world. Graduates of any accredited secondary school or equivalency program in the United States or abroad may apply for admission, as well as transfer students who have attended other institutions of higher learning.

Northeastern University admits qualified freshmen and transfer students to all programs in September and January. Freshmen are also admitted in April and June, depending on the availability of courses. In most programs, transfer students may apply for entrance at the beginning of each quarter.

The application process for all students is as follows. Refer to the International Students section on page 12 and the Transfer Students section on page 14 for additional requirements in these areas.

- Complete and sign the application form.
- Enclose the nonrefundable \$30 application fee. Make checks payable to Northeastern University. This fee may be waived in cases of extreme hardship as endorsed by the candidate's secondary school counselor or social worker.
- Mail the application form and the check to the Department of Undergraduate Admissions, 150 Richards Hall, Northeastern University, Boston, MA 02115.
- Arrange for transcripts and required test scores—College Entrance Examination Board (CEEB) or American College Testing Program (ACT)—to be sent to the University. (Transfer students do not have to submit test scores.)

Program Selection Because many applicants have difficulty in selecting a program of studies, the University allows students to explore alternative fields or tailor their programs to personal goals. Freshmen must indicate a choice of college and, in some cases, a major. In most colleges, students do not have to make a definite choice of major, concentration, or emphasis until the end of the freshman year. In some programs the decision may be delayed until the end of the sophomore year. Refer to individual college sections for specific requirements. Students are provided with additional assistance in planning their major by conferring with their academic advisers and through experience gained by participating in the Cooperative Plan of Education.

Rolling Admission Plan Under Northeastern's Rolling Admission Plan, decisions on admission are made as soon as all of the required credentials (including first marking-period senior grades and CEEB or ACT test scores) have been submitted and reviewed. In all cases of acceptance, candidates must complete their senior year of high school. Students should note that enrollments are limited in some programs in which the number of applications is expected to exceed campus resources.

Early Admission—Juniors, Second-Semester Seniors In certain cases, students may enroll at Northeastern prior to high school graduation. Such students may enroll either in September or in January, thereby reducing by one year the time to complete degree requirements. A special form provided by the Committee on Admissions requires the endorsement of the school principal or guidance counselor for early admission.

Deferred Admission Plan Accepted students who wish to participate in the Deferred Admission Plan will be asked to describe the activities they plan for the year preceding enrollment. Students may choose this plan for reasons such as travel, health problems, or work.

■ Required Deposits

If the Committee on Admissions makes a favorable decision on a student's application, the student is asked to submit a nonrefundable tuition deposit of \$100 by May 1. This deposit indicates intent to enroll and is applied to the first-quarter tuition account. Students applying for entrance dates other than September should note the required deposit date on their certificates of acceptance. For additional information about deposits required for international students, refer to the International Students section on page 12.

Students interested in on-campus housing must submit a nonrefundable \$400 deposit along with a completed housing application form to complete the housing application process. Information about this required nonrefundable deposit is mailed by the Department of Residential Life to all students accepted for admission following receipt of the tuition deposit by the University's Bursar. For more information and instructions, see the Housing section, pages 35–39.

■ English-as-a-Second-Language Proficiency Requirement

Before being considered for admission, students whose native language is not English are required to demonstrate some English language proficiency. This can be done by submitting the results of the College Board's Test of English as a Foreign Language (TOEFL), by successfully completing an approved English-as-a-second-language course of study, or by being enrolled in such a course.

Before they are allowed to enroll in academic coursework, all students whose first language is not English are required to take the English Proficiency Test administered by the University's English Language Center. This requirement applies to all non-native speakers.

The results of this test are used to assign students to appropriate English courses. Students with minimal English language skills are assigned to a noncredit intensive English course. The level of coursework required will determine the student's academic schedule.

■ College of Arts and Sciences Degree Programs

College of Arts and Sciences students may choose the five-year Cooperative Plan of Education or elect to enroll in a traditional four-year degree program without co-op.

■ Four-Year Co-op Option

College of Engineering and College of Computer Science students who wish to complete their undergraduate degree in four years may elect to enroll in the Four-Year Co-op Option. In order to participate, students must meet the program criteria and follow a prescribed schedule of academic and co-op quarters.

With a curriculum identical to the five-year program, the Four-Year Co-op Option provides students with four, rather than seven, quarters of cooperative education experiences at leading high-technology and engineering corporations across the country and around the world. Average co-op earnings depend on the number of quarters students spend on cooperative education.

■ Alternative Freshman-Year Program

The Alternative Freshman-Year Program was developed in collaboration with University College, a division of Northeastern serving students who seek a flexible course schedule. This degree-track program is often ideal for those students who feel that their high school grades and/or test scores do not reflect their true abilities. It can serve as a means of re-entry into more traditional college programs.

This program is structured to assist students in making the academic and social adjustments necessary for success in college. Working with a counselor, students follow a prescribed curriculum designed to meet their individual needs and to help sharpen their skills in writing, mathematics, and reading comprehension; at the same time they gain confidence in their ability to do college-level work. In addition, the program permits students to sample different areas of study before committing themselves to a specific major.

Students who have applied for regular admission to the University and whose credentials do not indicate success in the traditional freshman-year programs may be provided the opportunity to begin their University experience by entrance into this program.

The full range of counseling services, physical education facilities, and extracurricular programs is generally available to students enrolled in this program. For more information about the Alternative Freshman-Year Program, see pages 175–177.

■ Skill and Competency Development

Responding to a growing national concern for the improvement of basic writing, numerical, and reading/study skills, the University extends to freshmen in several of its participating colleges the opportunity to enhance the likelihood of academic success through enrollment in compensatory courses.

Selection for such coursework is based on the correlation of competency data, derived from specifically prepared testing procedures administered on campus, with pre-college academic credentials.

■ Boston Housing Authority Grant Program

Northeastern University offers one hundred tuition grants for residents of Boston Housing Authority (BHA) developments as part of the University's long-standing commitment to the City of Boston and its residents. Students who receive these grants must meet the admissions requirements to one of the full-time degree programs at Northeastern, file a Financial Aid Form, and verify their BHA residency.

■ Open Campus Plan

Northeastern's Open Campus Plan enables qualified high school students to take full-credit courses at Northeastern while still enrolled in secondary school. Students can gain a better idea of the collegiate environment while they work toward college credit. For more information, contact the Department of Undergraduate Admissions.

International Students

The University welcomes qualified students from other countries. At present, nearly 2,500 international students from over 115 countries attend Northeastern. The University is authorized under federal law to enroll nonimmigrant aliens as full-time students in degree-granting programs.

Most international students participate in the University's Cooperative Plan of Education. Co-op, as it is commonly called, is a unique five-year program that combines outstanding academics with paid professional career training.

Application Procedures In addition to following the application process described on page 10, international students must

- submit the Supplementary Form for International Applicants, according to the following schedule:

Entrance Date	Application Deadline
Fall quarter (freshmen and transfer applicants)	May 1
Winter quarter (freshmen and transfer applicants)	September 1
Spring quarter (freshmen* and transfer applicants)	December 1
Summer quarter (freshmen* and transfer applicants)	March 1

*depending on the availability of courses

- submit the same credentials as U.S. citizens. All credentials must be official documents or certified true copies. Credentials in languages other than English must be accompanied by certified literal English translations. Applicants with previous university-level studies should submit official course descriptions or syllabi for all coursework completed to facilitate the evaluation of transfer credit.
- demonstrate English language proficiency if their first language is not English. See page 11 for details about fulfilling this requirement.
- after acceptance, submit the required tuition deposit of \$100 and the university's Declaration and Certification of Finances Form by the date specified on the acceptance certificate. Upon receipt and approval, a Certificate of Eligibility (I-20 form or IAP-66 form) will be issued.
- if students are transferring to Northeastern from another college or university in the United States, one of the following is required. Students returning home before entering Northeastern must re-enter the United States on the I-20 or IAP-66 issued by the University. Students not returning home must present the Northeastern-issued I-20 or IAP-66 to the International Student Office during registration and orientation.

To obtain an application or additional information, contact the Department of Undergraduate Admissions.

Advanced Standing Credit The University considers awarding advanced standing credit to students whose secondary school education exceeds the requirements met by students in the American educational system. Inquiries about advanced standing credit should be directed to the Department of Undergraduate Admissions.

International Baccalaureate The University recognizes the advanced level of academic preparation offered by the International Baccalaureate. Up to one year of credit is generally granted for scores of 5, 6, or 7 on higher level examinations, as applicable to the degree being pursued.

Ambassador Awards See page 19.

Transfer Students

Applicants who have completed one or two years of study in an accredited college, university, or technical institute or who have earned an associate's degree from an accredited junior college or other two-year program may seek admission as upper-class students. Refer to page 18 for transfer orientation and registration information.

Transfer students may request advanced standing credit as upperclass students on the basis of acceptable credits earned in an accredited two- or four-year institution or a technical institute. For information on the Advanced Placement program and the College Level Examination Program (CLEP), see page 17.

Basic Requirements Candidates applying for transfer to Northeastern University must have achieved a satisfactory college record—appropriate to the course of study they wish to pursue—at another institution. Credit is generally granted toward a Northeastern degree for a grade of C or better in any reasonably equivalent course completed at another accredited institution. Candidates must be in good standing and must be eligible to continue in the institution they are currently attending.

Application Procedure Transfer candidates must follow the application process described on page 10, with the exception that they do not have to submit CEEB or ACT scores. In addition, transfer candidates must

- indicate their choice of college and major on the application;
- request that an official transcript from each college attended be sent to the Department of Undergraduate Admissions directly from the Registrar's Office of the respective colleges;
- submit a listing of courses in progress for the current academic year (including course number, course title, and number of credits to be earned in each course);
- demonstrate English language proficiency if their first language is not English. See page 11 details about fulfilling this requirement.

The deadlines for transfer applications are as follows:

Entrance Date	Application Deadline
Winter quarter	November 1
Spring quarter	February 1
Summer quarter	May 1
Fall quarter	July 1

Special Students

A limited number of special students may be enrolled in the Basic Colleges. Although special students are not degree candidates, they must meet criteria set by the college in which they propose to take courses.

In general, individuals enrolled as special students have completed varying amounts of college-level work. The following are among the types of applicants who are considered:

- college or university graduates who need additional coursework to prepare or qualify for a graduate program;
- individuals, recommended by deans or program directors, who need particular formal coursework to meet professional requirements for certification;
- students who need a few courses to complete degree requirements at another college or university.

Before completing a *Special Students Form*, which may be obtained either in the appropriate college office or in the Registrar's Office (120 Hayden), the prospective special student should consult, and receive the approval for enrollment from, a counselor in the office of the dean of the college offering the course(s) desired. The locations of the college offices are Arts and Sciences—400 Meserve Hall, Boston-Bouvé—100 Dockser Hall, Business Administration—202 Hayden Hall, Computer Science—1161 Cullinane Hall, Criminal Justice—400 Churchill Hall, Engineering—220 Snell Engineering Center, Engineering Technology—120 Snell Engineering Center, Nursing—102 Robinson Hall, and Pharmacy and Allied Health—206 Mugar Building.

Special students may be enrolled in classes when space is available to accommodate them. Furthermore, special students generally may not exceed three academic quarters of study in the University; some may be limited to one quarter.

With the college-approved form, special students should proceed to the Bursar's Office (254 Richards Hall), where a bill will be prepared reflecting the quarter-hour rate in effect at the time. The bill must be paid at the Cashier's Office (248 Richards) before registration is valid. Those interested in becoming special students in the Part-Time Engineering Program should go to 220 Snell Engineering Center to request registration information during the first week of an academic quarter.

Finally, the Registrar (120 Hayden Hall) will add the special student(s) into the course(s) once the aforementioned steps have been satisfied.

General Requirements for Entrance

An applicant for admission to Northeastern University has, ideally, completed an academically challenging secondary school program—one that includes courses in English, mathematics, laboratory science, history, and a foreign language. Proficiency in a foreign language is especially important for applicants interested in study or cooperative placement abroad. In addition to achievement in subjects critical to university studies, an applicant's overall record can reflect a wise choice of electives and serve as clear evidence of sound study habits. Candidates should also have read broadly outside of class and developed an ability to communicate ideas effectively.

Northeastern is interested in the growth of the work-study concept in many secondary schools, and the Committee on Admissions looks favorably on the variety of these worthwhile experiences. Achievement in secondary school has been shown to be the best single predictor of college academic success. This factor, together with recommendations from the school counselor, weighs most heavily in the evaluation process.

■ Preparation for Engineering, Computer Science, Sciences, Mathematics, Pharmacy and Allied Health Professions, Nursing, and Human Development Professions

Evidence of special aptitude and the highest possible level of preparation in the sciences and mathematics is essential for admission to most programs in engineering, computer science, sciences, mathematics, pharmacy and allied health professions, nursing, and human development professions. Applicants are encouraged to complete a full sequence of science and mathematics courses. In science, such a sequence usually includes a year of study and laboratory work in biology, chemistry, and physics; and, in mathematics, geometry, Algebra I and II, and a fourth year of trigonometry and/or analysis. Applicants to programs emphasizing mathematics and science also need courses in the social sciences and humanities to be fully prepared for advanced study. (For information on the programs of study in these fields offered by the College of Arts and Sciences, the Boston-Bouvé College of Human Development Professions, the College of Computer Science, the College of Engineering, the

College of Nursing, and the College of Pharmacy and Allied Health Professions, refer to the descriptions of each college later in this book.)

■ **Preparation for Study in the School of Engineering Technology**

Applicants are encouraged to complete a full sequence of mathematics, including geometry, Algebra I and II, and analysis. A full year of study and lab work in a natural science is also encouraged. Candidates for study in this diversified discipline also need courses in the social sciences and humanities to be fully prepared for advanced study.

■ **Preparation for Study in Business Administration**

Candidates for study in this diversified discipline must have completed a strong preparatory program in high school that emphasized the humanities, social sciences, and natural sciences. Applicants also must have had several years of mathematics, including geometry and Algebra I and II.

■ **Preparation for Study in the Arts and Humanities, the Social Sciences, Teaching, and Criminal Justice**

Candidates for admission who have enjoyed their greatest success in the study of the humanities and social sciences may choose to apply for admission to one of the following programs.

College of Arts and Sciences Students who plan to major in art, theatre, English, foreign languages, music, philosophy, and speech communication should have demonstrated the ability to succeed in these areas of study during high school. Candidates who plan to pursue careers in anthropology, economics, history, human services, linguistics, political science, psychology, or sociology should have a well-rounded background in the social sciences. Applicants to the School of Journalism should have worked on the writing and production of high school publications or audio- or videotape productions.

Boston-Bouvé College of Human Development Professions Students seeking certification as teachers in early childhood education or elementary education or those majoring in human services or recreation management should have demonstrated interest in the behavioral and social sciences through their high school courses.

College of Criminal Justice The program in criminal justice requires a strong base of liberal arts study before professional courses are introduced. Applicants for admission should have demonstrated the ability to succeed in their study of the behavioral, social, and human sciences.

■ **Entrance Examinations (Freshman Applicants)**

The Scholastic Aptitude Test and three achievement tests of the College Entrance Examination Board or the American College Testing Program are required, but they constitute only one factor in the admissions process. The Committee on Admissions recognizes that these test results do not measure such qualities as determination, imagination, and leadership.

English composition is one of the three required achievement tests. Students may choose the other two tests in subjects in which they feel most confident. Students whose native tongue is not English should substitute the Test of English as a Foreign Language (TOEFL) for the English composition test. (See page 11 for full details on fulfilling the English-as-a-Second-Language requirement.) No single schedule of testing is recommended, but applicants are advised to take subject matter tests while studying those subjects.

For more information about College Board Examinations, consult a school guidance counselor or write directly to The College Board, P.O. Box 592, Princeton, NJ 08540 or P.O. Box 1025, Berkeley, CA 94701. The American College Testing Program may be substituted for the College Board Testing Program. For more information, write to American College Testing Program, P.O. Box 168, Iowa City, IA 52243. Admissions counselors also will be glad to answer questions about these testing programs.

■ **Advanced Placement**

The University grants advanced placement credit to applicants with a score of 3 or better in their advanced placement examinations. Applicants may take the tests in art (history, studio—general, studio—drawing), biology, chemistry, computer science (A, AB), economics (microeconomics, macroeconomics), English (language, literature), French (language, literature), German (language), government and politics (comparative, United States), history (European, United States), Latin (Virgil, Catullus–Horace), mathematics (calculus AB, BC), music (theory), physics (B, C mechanics–C electricity, magnetism), and Spanish (language, literature).

Applicants who wish to submit scores for advanced placement are required to take the Advanced Placement Tests of the College Board in May.

■ **College-Level Examination Program**

The University cooperates with the College Board in its College-Level Examination Program. CLEP provides a national program of 5 general examinations and 30 subject examinations to evaluate nontraditional college-level education. Qualified students are encouraged to take the general and/or subject examinations of CLEP so that college credit may be allowed upon entrance. In general, the Committee on Admissions accepts the score range recommendations of the College Board. Northeastern has been designated a CLEP Testing Center. For more information, contact the Counseling and Testing Center at 302 Ell Student Center, 617-437-2142.

■ **Health Requirements**

The Lane Health Center's Pre-entrance Physical Examination Form is sent to each student following acceptance at Northeastern. This form is considered a condition of admission. Each applicant must return the completed form, which includes a medical history, documentation of a recent physical exam, and a tuberculin test within six months of registration.

State law requires medical documentation of appropriate immunization against measles, mumps, rubella, tetanus, and diphtheria. As of August 1991, documentation of two measles vaccinations is required by Massachusetts state law. A rubella titre is mandatory for the health professions (Medical Laboratory Science, Nursing, Pharmacy and Allied Health Professions, Radiology, and Physical Therapy). Tuberculin tests are required annually for nursing students and within three months prior to the practicum for student teachers. Junior-year physical therapy students will have a repeat exam performed at the Lane Health Center. A positive titre for Hepatitis B is required prior to beginning any clinical assignments, internships, or cooperative education quarters for the following groups of students: all undergraduate students and graduate students deemed at risk by their departments in Boston-Bouvé, Cardiopulmonary Sciences, Forsyth, Medical Laboratory Science, Nursing, Paramedic, Physician Assistant, and Radiologic Technology.

In accordance with Section 504 of the Rehabilitation Act of 1973, applications for admission are judged on the basis of qualification, not on the absence or presence of a medical or disabling condition. Any adjustments needed for such applicants are made to ensure access to college life, both academic and extracurricular.

Orientation and Registration

The orientation and registration program officially launches every student's academic career at Northeastern each quarter. The administration, faculty, and many upperclass students have planned several programs, faculty seminars, meetings, and special events designed to help new students adapt to college life at Northeastern. In addition to participating in regular registration operations, choosing courses, receiving class schedules, and purchasing books, new students meet with the dean and faculty members of their college, who provide information about academic majors, courses, and careers.

The University is keenly aware that the transition from high school, junior college, or another university continues in a variety of ways during the first year on campus. Faculty advisers are available for consultation on both academic and personal concerns (see Resources, Services, and Activities beginning on page 189). The University provides guided tours to historical and cultural centers to acquaint students with the Boston area. It also offers a series of seminars on how-to's (how to study successfully, be assertive, make friends), peer counseling, public safety, and student organizations. The Department of Cooperative Education, for example, plans meetings on job opportunities and school-work experiences. More than 150 student organizations (see page 202) exist on campus. In addition, a number of colleges and programs offer a student mentor service to assist students needing help with transitions to urban life, the Cooperative Plan of Education, or being a University scholar.

Transfer Students Transfer students should bring a copy of their official Certificate of Acceptance to the orientation and registration program. The certificate lists each course (and its credit value) for which the transfer student has received credit and the total number of credits issued. Students receive full transfer credit only for courses listed on the Certificate of Acceptance and for which a grade has been recorded on an official transcript from their former college(s).

Transfer credit from other institutions is not computed into the Northeastern University quality-point average. Northeastern University uses the quarter calendar and awards quarter hours of credit for courses that are successfully completed. Each quarter hour of credit is equivalent to three-quarters ($\frac{3}{4}$) of one semester hour. Most Northeastern courses are equivalent to three (3) semester hours of credit or four (4) quarter hours. Students who successfully complete 48 quarter hours generally qualify for sophomore standing, 80 for middler, 112 for junior, and 148 for senior. All upperclass course selection for transfer students is planned with their faculty advisers.

Honors Programs

■ University Honors Program

The University invites qualified students in each of its Basic Colleges to participate in a comprehensive honors program designed to foster and recognize superior intellectual development and achievements. Based on criteria established by an individual college for its own majors, students may be invited into the program as they enter the University or at any time during their college careers. For quality-point equivalents of honors, see page 41. Students may also be recommended for participation in the program or in its individual components by their faculty advisers and/or the honors committee of their college.

The smaller and more homogeneous class composition, the heightened levels of student-faculty interaction, and challenging intellectual content make the University Honors Program a stimulating educational opportunity. Various special limited-enrollment sections of many first- and second-year courses are offered for honors students. Other courses have been organized to permit students to undertake individual advanced-level work and to receive an honors designation on their transcripts.

Honors seminars on interdisciplinary subjects are open to honors students as part of their course load or as a free overload. Junior-senior honors programs, based on individual or small-group research projects under the direction of distinguished faculty, are available to qualified students. Successful completion of any honors course is noted on students' transcripts; completion of the honors program requirements can result in Honors Program Distinction at graduation.

Honors students may also avail themselves of university honors scholarships; an honors housing option; honors faculty advisers; an honors lounge and computer-equipped study area; and a range of social and cultural activities, including speakers and film series, colloquia, and excursions of various kinds.

For more information concerning freshman entry into the program, contact the Department of Undergraduate Admissions. For information concerning upperclass participation in the program, contact the University Honors Program, Nightingale Hall, Northeastern University, 360 Huntington Avenue, Boston, MA 02115, or telephone 617-437-2333.

■ Honors Scholarships

Ambassador Awards The University offers five half-tuition scholarships to non-U.S. citizens for the freshman year (September through June). These scholarships are awarded to individuals whose credentials provide evidence of exceptional academic achievement. The Ambassador Awards are given to freshmen enrolled in a full-time day academic program and are not renewable.

Dr. Ralph J. Bunche Scholars Program Northeastern honors the late Dr. Ralph J. Bunche, Nobel laureate and former undersecretary of the United Nations, by awarding ten scholarships annually to African-American students who have outstanding records of academic achievement and leadership. The Bunche awards are full-tuition scholarships in the freshman year and half-tuition grants in the remaining years of study, provided that the student maintains a superior scholastic average. Students who believe that they qualify for this award may obtain information and application materials from the Department of Undergraduate Admissions.

Carl S. Ell Presidential Scholarship Program This program was established to recognize some of the University's finest incoming students and to foster the continuation of their superior academic performance.

Each year a limited number of freshmen who have records from high school that exhibit exceptional promise are selected for this academic achievement award. Criteria for selection include high school records indicating a college preparatory program, class rank, grade-point average, extracurricular activities, community service, letters of recommendation from guidance counselors, and CEEB or ACT test scores.

The Ell Scholars are awarded full freshman-year tuition scholarships. Those who continue to maintain a superior scholastic average and to make a strong contribution to the University's academic and social life during their upperclass years at Northeastern are awarded one-half tuition grants for each subsequent year.

In addition to the awarding of financial assistance, the scholars are provided with a number of opportunities to engage in intellectual exchange on campus, including an invitation to join the Ell Scholars Association, an organization that endeavors to build a community of scholars within the University.

Application deadline for the program is January 1. In most cases, students are notified of their selection as Ell Scholars before February 1.

■ Joint Degree Programs

Bachelor of Science/Master of Science Joint Degree Program in Engineering Qualified high school students committed to reaching a high level of success in engineering may enter directly into the Five-Year Cooperative Education Bachelor of Science/Master of Science Joint Degree Program. This full-time program allows honor students to earn both degrees in five years, and at the same time gain extensive on-the-job experience through the Cooperative Plan of Education.

Offered by the departments of electrical and computer engineering, industrial engineering and information systems, and mechanical engineering, the B.S./M.S. program requires that students generally take five courses per quarter and maintain a 3.2 quality-point average. All students follow a basic curriculum of calculus, physics and labs, computer programming, and chemistry along with social sciences and humanities.

Bachelor of Arts or Bachelor of Science/Juris Doctor Degree Program Northeastern offers a unique joint degree program for aspiring lawyers—the eight-year Bachelor of Arts or Bachelor of Science/Juris Doctor Degree Program. A limited number of highly qualified freshmen are admitted to the five-year undergraduate portion of the program each year.

To progress into the law school portion of the program, students must graduate in the top 15 percent of their class and score in the top 20 percent of the Law School Aptitude Test (LSAT). Students who meet these criteria will be qualified to continue their studies at Northeastern University School of Law. Unique among American law schools, Northeastern University School of Law features cooperative legal education—the blending of legal apprenticeship with intensive academic study. For more information, contact the Department of Undergraduate Admissions.

Programs for Minority Students

Northeastern University is committed to expanding educational opportunities for minority students of high academic promise and to enrolling a student body that reflects the diverse ethnic and social composition of our society.

To ensure that minority students have the greatest opportunity for success, the University's African-American Institute provides tutorial, counseling, and academic services. Each spring, the institute holds an open house for prospective students.

- **Dr. Ralph J. Bunche Scholars Program** See page 19.

- **Project Ujima**

Project Ujima is an academic support program designed to assist minority students who have demonstrated an ability to succeed in college but who need additional academic assistance, particularly in their freshman year.

The Ujima program provides participants with a variety of support services to develop their academic skills and to foster the growth of a positive attitude toward learning throughout their years at the University. Counseling, peer mentors, tutorials, a reading and study skills course, and educational workshops are examples of some of the supportive activities sponsored by the project. Project Ujima is an academic component of the African-American Institute.

Cooperative Education



Cooperative education is based on the principle that what students learn in the workplace is as valuable as what they learn in the classroom. Cooperative education is a degree requirement for most programs. The University assists students in structuring cooperative work experiences and attempts to integrate work experiences into students' academic programs. But the University cannot do it alone. A student's interest and enthusiasm play a crucial role in determining the quality of cooperative education experiences. The success of the program depends upon the cooperation of educators, students, and outside agencies to produce an integrated and relevant program.

Studies show that reinforcing classroom learning with job responsibilities increases a student's motivation and self-confidence. Greater interest in academic work develops when students see the link between co-op experiences and principles taught in the classroom. Co-op students are able not only to evaluate career decisions early in their college years, but also to gain meaningful work experience before graduation and establish professional contacts and references. The salaries students earn in cooperative education experiences help defray tuition, room and board, books, and other expenses.

Department of Cooperative Education

Paul M. Pratt, M.Ed., *Dean*
Robert E. Vozzella, Ed.D., *Professor and Director, International Cooperative Education*
Patricia A. Venter, B.S., *Minority Liaison*

<i>Professors</i>	Stephen M. Kane, Ed.D.	Veronica L. Porter, M.Ed.
Nancy J. Caruso, M.Ed.	Judith A. Moll, M.S.	John A. Saltmarsh, Ph.D.
Robert W. Miller, M.Ed.	Ann C. Noonan, P.T., Ed.D.	William A. Sloane, M.B.A.
<i>Associate Professors</i>	Anthony R. Rotondi, M.Ed.	Donna R. Smith, M.A., M.Ed.
Boreslaw P. Berestecky, M.Ed.	Melvin W. Simms, Ed.D.	Gary M. Somers, M.A.
Betsey W. Blackmer, P.T., Ed.D.	Hugh J. Talbot, M.P.A.	Russell A. Straub, B.S.
Richard L. Canale, M.Ed., C.A.G.S.	Robert R. Tillman, Ed.D.	<i>Lecturers</i>
Elizabeth A. Chilvers, M.Ed.	<i>Assistant Professors</i>	Charles Bognanni, M.Ed.
Mark I. Conley, Jr., Ph.D.	Michael A. Ablove, M.Ed.	Patricia G. Brigham, M.B.A.
Robert D. Deforge, R.Ph., D.Ph.	Terry H. Chapman, Ph.D.	Rosemarie DiMarco, M.S.
Kathleen L. Finn, R.N., Ed.D.	Donald L. Eastridge, M.Div.	Barbara L. Elderkin, M.Ed.
Mary R. Flynn, R.N., M.Ed.	Joyce K. Fletcher, M.Ed.	Patrick Hickox, M.Arch.
	Ann M. Galligan, Ed.D.	William Rodriguez, M.S.
	Theresa A. Harrigan, Ed.D.	Martha L. Wengert, M.Ed.
	John C. Mulhall, M.S.	William E. Wray, J.D.

The Department of Cooperative Education administers cooperative education for all undergraduate programs in the Basic Colleges and the graduate programs in engineering.

Participation in the Cooperative Plan of Education is required of all students in the Basic Colleges except those in the College of Arts and Sciences. Although most Arts and Sciences students choose to take advantage of co-op, the college offers a full-time program in which eight quarters of upperclass study may be completed in three years.

Cooperative education curricula leading to the baccalaureate degree generally require five years at Northeastern University. Programs typically consist of a freshman year of three consecutive quarters of full-time study followed by four upperclass years in which students alternate periods of classroom attendance with cooperative education experiences. The College of Engineering and the College of Computer Science offer a Four-Year Co-op Option. (See pages 124 and 129.)

Students are assigned a faculty coordinator/counselor team that is responsible for all phases of the cooperative program and assists them in deriving greater value from their education at Northeastern. Personal interviews provide the basis for referral to specific opportunities that help students realize career objectives. The Department of Cooperative Education keeps abreast of activities in specific areas in order to provide counseling on opportunities and trends. In general, co-op experiences can become increasingly challenging and career-specific as the students' education and abilities grow.

Students may wish to participate in an activity other than paid employment during a cooperative period. They may wish to travel abroad, to do volunteer work, or to take specialized courses at another institution. Students may arrange time for these special activities with their coordinators.

Further details on the cooperative program are available in *Cooperative Education*, a booklet available from the Department of Undergraduate Admissions.

International Cooperative Education

Robert E. Vozzella, Ed.D., *Director*

The Office of International Cooperative Education offers a wide variety of services to international students and students from the United States. Through the International Exchange Program, qualified undergraduates may be placed abroad for their cooperative work experience. Placements abroad are currently available in the United Kingdom, Ireland, France, Germany, Austria, The Netherlands, Sweden, Australia, and Israel for students whose academic, linguistic, and professional experience make them appropriate candidates.

International students may receive assistance on matters relating to their co-op employment, such as Social Security and tax information, as well as issues involving the verification of their immigration and co-op status.

The course "Working in the United States," created expressly to meet the needs of undergraduate international students, is taught by the staff of the Office of International Cooperative Education. It is designed to assist such students in competing more effectively for domestic cooperative education positions and to facilitate their cultural adjustment into the American work force.

New co-op programs are also being developed in some of the home countries of international students where economic and social conditions permit such undertakings. Limited opportunities with various multinational corporations (primarily those having operations in the Asia/Pacific Region) are available for international students majoring in engineering, computer science, and business administration.

College Expenses



Tuition rates, room-and-board charges, and fees are subject to revision by the Board of Trustees at any time. All registered Basic College students are considered full-time and are charged full tuition for coursework of 12 quarter hours or more. In addition, charges are made for coursework beyond the normal academic schedule.

Students should note that the freshman year consists of three quarters of full-time study. The Cooperative Plan of Education, whereby students may be gainfully employed, does not begin until the sophomore year.

The primary purpose of cooperative education is to provide invaluable on-the-job training, but co-op also helps make education possible without the accumulation of a large personal debt. Because of the plan—and the University's determination to keep basic expenses as low as possible—many deserving students who might not otherwise be able to afford an education choose Northeastern.

Annual Costs

The chart that follows indicates annual costs for most students. Except for the international student fee, all fees charted are estimates. Costs vary with the year and program of study. Tuition is paid in installments at the beginning of each quarter. Tuition for freshmen is computed by the year and paid in three equal installments. Those enrolling in September pay at the beginning of the fall, winter, and spring quarters; January enrollees pay at the beginning of the winter, spring, and summer quarters. Upperclass students pay for each academic quarter enrolled.

Room-and-board expenses in University-sponsored residences vary with assigned residence hall. Costs are computed on the basis of a seven-day week and are billed quarterly. (See page 37 for detailed per quarter room and board costs.)

Freshmen payment deadlines are August 30, 1991; December 16, 1991; and March 23, 1992. Deadlines for January enrollees are December 16, 1991; March 23, 1992; and June 15, 1992.

Upperclass payment deadlines are by division. Division A students pay September 16, 1991–March 23, 1992; Division B, December 16, 1991–June 15, 1992. Division C students, those who are temporarily or permanently on a non-cooperative plan year, pay beginning September 16, 1991; December 16, 1991; and March 23, 1992.

Tuition

<i>College/School</i>	<i>Freshmen</i> (3 quarters)	<i>Upperclass Students</i> (2 quarters)
Business Computer Science Engineering Engineering Technology	\$10,740 (\$3,580)	\$10,160 (\$5,080)
Arts and Sciences Journalism Boston-Bouvé Criminal Justice Nursing Pharmacy and Allied Health Alternative Freshman-Year Program	\$9,930 (\$3,310)	\$9,160 (\$4,580) n/a
Boston-Bouvé Physical Therapy	\$10,350 (\$3,450)	\$9,580 (\$4,790)

Other Fees and Expenses

Fees	\$610	\$588
Books and Supplies	\$480	\$400
International Student Fee	\$200 once upon entrance	same
Additional Personal Expenses	\$600	\$400
Commuter Transportation	\$750	\$500

Room and Board

At the beginning of the first quarter, all entering freshmen residing in University residence halls will be billed for the 19 meals per week option (\$1,045 per quarter). For more information, see page 37.

Room	\$1,025–\$1,365 per quarter	same
Meal Plan Options	\$860–\$1,045 per quarter	\$415–\$1,045 per quarter

Fees

■ Required Fees for All Students

Application Fee This nonrefundable \$30 fee is required when the application for admission is filed.

Tuition Deposit A nonrefundable tuition deposit of \$100 is due by May 1 from all incoming students. The deposit indicates intent to enroll and is applied to the first-quarter tuition account. Students applying for entrance dates other than September should note the required deposit date on their certificates of acceptance.

Student Activities Fee This \$10 fee is required of all students to fund student clubs, activities, and organizations.

Student Center Fee All students in the Basic Colleges on the Boston campus pay this \$12.50 fee for the services available in the Carl S. Ell Student Center.

Photo-Identification Card All full-time students, staff, and faculty are required to have an officially approved and properly validated photo-identification card. This \$2 card is issued to new students at orientation and registration. Students must show the card at the library, athletic events, student elections, Health Services, and the offices of the bursar or registrar. A replacement card costs \$5.

Residence Hall Activities Fee All students living in the residence hall system are charged a quarterly \$5 fee for program activities sponsored by the Residence Student Association and the hall governments.

Accident and Sickness Insurance The University provides an excellent hospital insurance and student health program. The nonrefundable University Health Service fee of \$525 covers the group Blue Cross/Blue Shield program and medical services provided by the Health Service. This fee is annual, not quarterly.

■ Other Fees

Deferred Payment Deferred payment of tuition entails a \$10 fee that is levied on all accounts not paid by the end of the second week of classes. To arrange for the deferred payment plan, students must contact the Office of the Bursar before the start of the second week of classes. The following is the only deferred payment plan available:

Portion of Bill per Quarter	Payment Deadline
First payment 1/3	First week of quarter
Second payment 1/3	Fourth week of quarter (approx.)
Third payment 1/3	Eighth week of quarter (approx.)

Late Payment Fee This \$100 fee is assessed for failure to arrange for, and make, payments in accordance with the prescribed regulations.

International Student Fee The one-time fee of \$200 is charged to new undergraduate international students, billed and payable after their acceptance at Northeastern.

Laboratory Deposits Students taking laboratory courses should be prepared to purchase laboratory deposit cards from the Office of the Cashier as directed by the department offering the course. These deposits will be drawn upon to cover any breakage and destruction of apparatus in the laboratory.

Liability Insurance Freshmen in the Colleges of Nursing (bachelor's degree program and special program for RNs) and Pharmacy and Allied Health Professions (respiratory

therapy only), as well as all upperclass students in Nursing, Pharmacy and Allied Health Professions (excluding health information administration), and most students in certain programs in the Boston-Bouvé College of Human Development Professions are required to carry an \$18 liability insurance.

Housing Deposit Students seeking on-campus housing must submit a nonrefundable \$400 deposit along with a completed housing application form to complete the housing application process. For more information and instructions, see the Housing section, pages 35–39.

Upperclass Housing Deposit The upperclass housing deposit fee is \$75 per quarter.

Warren Center Fees Physical education majors pay a room-and-board charge for a resident program at the Warren Center in the spring quarter of the freshman year. Recreation and leisure studies students pay a fee in the freshman year for a one-week term of camping at the Warren Center.

■ Textbooks and Supplies

The Bookstore is on the ground floor of the Ell Student Center. All books and supplies required for coursework at the University may be purchased there.

■ Uniforms

College of Nursing Students in the College of Nursing may expect to be assessed fees for clinical laboratory experiences and for the Nursing Resource Laboratory. In addition, candidates in the College of Nursing who want graduation pins are expected to pay approximately \$200 for each pin. Students in the baccalaureate degree program of the College of Nursing purchase uniforms in the fall quarter of the sophomore year.

College of Pharmacy and Allied Health Professions Dental hygiene and radiologic students purchase uniforms in the fall quarter of the freshman year. Students in the medical laboratory science program buy laboratory coats in the spring quarter. Respiratory therapy students buy their uniforms in the spring quarter of the sophomore year.

Co-op assignment to a hospital usually entails purchase of a uniform in the spring or summer quarter of the sophomore year.

Reserve Officers' Training Corps Uniforms are issued without cost to ROTC cadets. A \$35 deposit is required to ensure the return of the loaned property in good condition. Any loss or damage exceeding the deposit will be charged to the student.

Payment of Tuition

All payments should be made by mail or at the Office of the Cashier, 248 Richards Hall. Checks should be made payable to Northeastern University. Beginning with the second week of any quarter, students are not eligible to attend classes unless their tuition has been paid or specific arrangements have been made with the Bursar for a plan of deferred payment.

It is the student's responsibility to ensure that all tuition and dormitory charges and fees are paid when due. If a bill has not been received prior to the start of classes each quarter, the student must come to the Office of the Bursar where a bill will be processed. If there is a billing problem, the undisputed portion of the bill

should be paid on time to avoid any additional late fees. Failure to receive a bill through the mail or to pay the undisputed portion of the bill is not justification for late payment of amounts actually owed.

■ **Overloads**

Tuition covers the cost of each student’s required courses for a quarter. In addition, a course worth one quarter hour of credit may be taken without added charge. However, any other additional courses will be billed as overloads.

Refunds

The University provides all instruction on an academic-quarter basis, for which students pay at the beginning of each quarter. Tuition refunds in all schools and colleges may be granted through the first four weeks of a quarter only when specific conditions are met and on the basis of the date appearing on the official withdrawal application. (Nonattendance does not constitute official withdrawal.) Questions regarding refunds should be discussed with the Office of the Dean of Students. When approved, refunds are made as follows:

■ **Tuition Refund**

Official Withdrawal Date	Tuition Refund
1st week of quarter	100 percent
2nd week of quarter	75 percent
3rd week of quarter	50 percent
4th week of quarter	25 percent

■ **Room and Board Refund**

Rental charges for rooms in University accommodations are refundable only in cases of withdrawal prior to the start of a quarter (except in special circumstances so adjudged by the University). The deposit is not refundable. Board charges may be refunded for all unused portions when the food identification card is surrendered to the University Dining Service.

Financial Aid



Jean C. Eddy, M.S., *Director of Financial Aid*

The Office of Financial Aid provides a full range of financial services to assist students in paying for their education. In addition to determining eligibility for traditional federal, state, and institutional financial aid programs, the office provides information and services on alternate sources of financial assistance, a reference library, and a part-time job referral service. For assistance or information, contact the office at P.O. Box 75, 356 Richards Hall, Boston, MA 02117; 617-437-3190. Office hours are 8:30 A.M. to 4:30 P.M. from September through June. From July through August, information is available Monday through Thursday from 8:00 A.M. to 5:30 P.M.

The office library contains resource materials on scholarships, grants, fellowships, prizes, and awards offered by outside agencies and organizations. These reference

books, catalogs, and pamphlets are available for review to all Northeastern students during the regular office hours of 8:30 A.M. to 4:30 P.M.

Part-time job opportunities are posted on bulletin boards outside 356 Richards Hall. Most part-time job opportunities are off campus. The part-time employment office also provides assistance in preparing résumés, tips on job interviews, and other information useful in obtaining part-time employment.

Financial aid funds that are awarded on the basis of family income and financial need are administered in accordance with nationally recognized and accepted principles. A fundamental premise of Northeastern's need-based financial aid program is that parents have an obligation to pay for the education of their children to the extent that they are financially able. In addition, students are expected to contribute to their educational cost from summer and co-op earnings, outside agency awards, their own assets, and other resources they may have. Financial aid is awarded only for meeting the difference between total family contribution (from parent and student) and annual educational costs.

Financial aid must be applied for annually. Criteria established by the College Scholarship Service and approved by the U.S. Department of Education are used in making an evaluation of eligibility. This evaluation includes an objective analysis of the family's financial circumstances, including income, household size, number of family members in college, assets, and indebtedness.

■ Eligibility and Selection

All financial aid is contingent on the availability of funds. In order to be eligible to participate in the financial aid program at Northeastern University, all students must

- possess U.S. citizenship or be eligible permanent residents of the United States;
- attend Northeastern University;
- have documented financial need;
- apply for financial aid on the proper application forms and in a timely fashion;
- be enrolled in an eligible degree or certificate program on at least a half-time basis and be making normal academic progress as determined by the college of enrollment;
- meet any other eligibility requirements of the individual aid programs.

Due to limited funding, Northeastern is not always able to meet the full financial need of all applicants. Priorities in awarding aid will be based on highest financial need, meeting application deadlines, and the potential for academic achievement.

■ Application Procedure: Undergraduate Programs

Initial Year (Freshmen and Transfer Students) Applicants seeking financial assistance are required to complete and mail a Financial Aid Form (FAF) to the College Scholarship Service by March 1 for summer or fall entrance and by October 15 for winter or spring entrance. Transfer applicants must also have completed financial aid transcripts from all previously attended post-secondary schools. Financial aid transcripts must be received by April 15 for summer or fall entrance and by October 15 for winter or spring entrance.

On the FAF applicants must list Northeastern University (code 3667), the Pell Grant Program, and any applicable state scholarship program as recipients of the FAF. The FAF is available from secondary school guidance offices or the Office of Financial Aid.

Awards are made on a first-applied, first-aided basis and are contingent on continued funding. The typical award takes the form of a package combining a grant, a loan, and/or part-time employment. Awards may be adjusted at any time upon receipt of other funds or changes in status.

Upperclass Students (Continuing Sophomores–Seniors) Upperclass applicants are required to submit a Financial Aid Form to the College Scholarship Service and a Northeastern University Upperclass Application for Financial Assistance each year for which they desire assistance. On the FAF, applicants must list Northeastern University (code 3667), the Pell Grant Program, and any applicable state scholarship program as recipients of the FAF. The FAF must be filed by March 1 for all upperclass aid applicants. The Upperclass Application is due by April 15. Financial aid awards are made for the entire academic year.

Office Hours The Financial Aid offices are located in 356 Richards Hall, telephone 617-437-3190. Office hours are 8:30 A.M. until 4:30 P.M. from September through June. In July and August, information is available Monday through Thursday from 8:00 A.M. until 5:30 P.M.

State Assistance Programs

The Office of Financial Aid requires applicants for aid to apply to state scholarship programs at the same time that they apply for aid from the University.

State Grants and Scholarships The Commonwealth of Massachusetts provides scholarship aid to Massachusetts students pursuing full-time programs of study in an accredited college or university. Application is made by completing the Massachusetts version of the Financial Aid Form by the published deadline. Awards are made in the summer of each year, and applications for entering freshmen are available through their high school guidance offices. Out-of-state students should investigate aid programs in their respective states. Connecticut, Delaware, District of Columbia, Maine, Maryland, New Hampshire, Pennsylvania, Rhode Island, and Vermont allow students to use their state grants at Northeastern.

Massachusetts Educational Financing Authority The Family Education Loan Program in cooperation with Northeastern University offers a program of Family Education Loans, under which parents can borrow to pay the cost of education and repay in low monthly installments spread over 15 years. Neither students nor their parents need to be Massachusetts residents in order to qualify. A creditworthy spouse may also borrow under the program.

To participate, a student must be enrolled at least half time. Families may borrow from \$2,000 up to 100 percent of the yearly cost of attendance. Applications may be requested from the Office of Financial Aid.

Federal Programs

All federal financial aid programs are subject to change, depending upon adequate and continuing federal support.

Pell Grant This is a program of direct federal grants to undergraduate students only. Eligible students can receive as much as \$2,400 per year toward the cost of their education. Pell Grants are generally available to all students who have not previously received a bachelor's degree, who are citizens or eligible permanent residents, and who are attending college on at least a half-time basis (minimum six quarter hours). Students must be enrolled in an eligible program for the purpose of obtaining a degree or certificate. All students applying for financial aid must file for a Pell Grant.

Applications for a Pell Grant can be made on the Financial Aid Form (FAF), which is available from local high schools, or by telephoning the Office of Financial Aid.

College Work-Study Program This federally sponsored, need-based program of part-time employment is designed to help full-time students meet their educational expenses. Students generally work part-time while attending classes. Eligible students may work for the University or for public or private nonprofit off-campus agencies.

Supplemental Educational Opportunity Grant Provided by the federal government, Supplemental Educational Opportunity Grants are direct awards available to a limited number of full-time undergraduates who present evidence of significant financial need, typically Pell Grant eligibility. Eligible students may receive Supplemental Educational Opportunity Grants ranging from \$100 to \$4,000 per year.

Health Professions Loan This program is available to full-time undergraduates who have been accepted for a course of study leading to a bachelor of science degree in pharmacy. A student who evidences financial need and academic promise may borrow as much as \$2,500 per academic year. Repayment of principal and interest does not begin until nine months after the student ceases full-time study. Repayment of principal may be extended over a ten-year period, with 5 percent interest per annum.

Stafford Loan Program (formerly Guaranteed Student Loan Program) Under this program, students enrolled for at least one-half the normal academic work load may borrow up to \$2,625 per academic year for the first two years of their degree or certificate program and up to \$4,000 per year for the next three years. The federal government pays the interest while the student is in school. Repayment must begin six months after enrollment drops below half-time.

Applications are available from local lending institutions; the Office of Financial Aid can provide additional information. All students must have a Financial Aid Form on file; upperclass students must also file a Northeastern Upperclass Application for Financial Assistance before submitting their loan applications.

Parent Loans for Undergraduate Students Under the program (known as PLUS), parents of dependent undergraduate and parents of dependent graduate students may borrow up to \$4,000 per year for each child enrolled in an approved educational institution. These loans are offered by banks and other financial institutions. Terms and availability vary from state to state.

Unlike the Stafford Loan Program, the PLUS loan requires repayment of the loan to begin within 60 days of receipt. Repayment may be stretched out over ten years if the minimum monthly payment of \$50 is maintained. Applications and more information can be obtained from local lending institutions.

Perkins Student Loan (formerly National Direct Student Loan) Perkins Loans are available to students who present evidence of needing financial assistance. Undergraduate students may borrow up to a maximum of \$4,500 for the first two years, or a total of \$9,000 for their entire undergraduate education. Students are allowed a total maximum of \$18,000 through their undergraduate and graduate educations.

Repayment of principal and interest on Perkins Loans is not required until six or nine months after a student graduates, withdraws, or drops below half-time enrollment. Repayment of principal may be extended over a ten-year period, with the interest rate at 5 percent per annum. Repayment may be deferred up to three years if the student is pursuing at least a half-time course of study or serving in the Peace Corps, VISTA, or the armed forces.

Nursing Student Loan This program is for full-time undergraduate students who have been accepted for a course of study leading to a bachelor of science degree in nursing. Provided financial need is evident, students may borrow up to \$2,500 each year to a maximum of \$13,000 for their entire undergraduate education.

Repayment and interest on these loans do not begin until nine months after the student ceases to pursue full-time study. Repayment of the principal may be extended over a ten-year period, with the interest at the rate of 5 percent per annum.

Supplemental Loans for Students Under the supplemental loans program, independent undergraduate and all graduate students, whether dependent or independent, may borrow up to \$4,000 per year. These loans are offered by various banks and other financial institutions. Unlike Stafford Loans, the federal government does not pay the interest while the student is in school; the interest is added to the principal.

The student must begin repayment after dropping below half-time enrollment. Applications and more information are available from participating local lending institutions. Students must apply for Stafford Loans before applying for the SLS program.

Reserve Officers' Training Corps Scholarship Program See the Scholarships sections under Reserve Officers' Training Corps, pages 178–181.

University Scholarships

The University awards numerous scholarships through the Office of Financial Aid. Because each scholarship is awarded specifically to students who qualify, students should not apply for any specific scholarship. However, students who feel they may be a potential recipient for certain awards may bring that fact to the attention of the Office of Financial Aid by noting their interest in particular scholarships on the Upperclass Application. For a complete list of University scholarships, see pages 214–231 of the Appendix.

Other Scholarships

Several scholarships awarded to Northeastern students are funded by outside sources. Recommendation for the specific award is made by one of the several college scholarship committees or the departments concerned, in conjunction with the Office of Financial Aid. Students who feel they may be a potential recipient for any of these awards should notify their financial aid counselor in writing. For a complete list of scholarships funded by outside sources, see pages 232–234.

Housing



Department of Residential Life

Ronald L. Martel, Ph.D., *Director*

Michael A. Gilbert, M.Ed., *Associate Director for Student Life*

Andrew J. Mahoney, B.S., *Associate Director for Facilities and Operations*

John A. Niven, B.S., *Associate Director for Administrative and Technical Services*

Adjusting to college life is challenging on several levels. Mindful of this, the Department of Residential Life strives to provide students with a supportive environment and a strong sense of community.

■ Residence Halls

The University provides a variety of residence halls: freshman, coed, and single-sex halls; upperclass men's and women's apartments; three academic theme halls (Honors, Engineering, and Computer Science Program); an international hall; a

substance-free hall; and designated quiet locations. Each residence hall is under the direction of a full-time professional residence director, assisted by a team of resident assistants who provide educational and social programs and support residents in their academic and personal development. Students living in a residence hall are members of their respective residence hall councils, which represent student opinions and assist in the organization of programs and activities.

Most residence halls have lounge and study areas, as well as laundry and recreation rooms. Student rooms are equipped for comfortable residence hall living. The University supplies a bed, dresser, desk, and chair for each student. Students provide their own draperies, bedspreads, bed linen, pillows, towels, lamps, rugs, bookcases, and wastebaskets. The Department of Residential Life is located in 104 Ell Building. For more information, telephone the appropriate number.

Telephone Numbers and Hours

Assignments and Billing	104 Ell Building 617-437-2814 FAX 617-437-8794 8:30 A.M.-4:30 P.M.
Student Life	4 Speare Hall 617-437-2004 8:30 A.M.-4:30 P.M.
Facilities and Operations	17 Cushing Hall 617-437-5872 8:30 A.M.-4:30 P.M.

Note: The hours listed are for September through June. From July through August, information is available Monday through Thursday from 8:00 A.M. to 5:30 P.M.

■ **Housing Options**

The choice of housing is an important consideration for the freshman year, and students are encouraged to visit Northeastern before making a decision. In general, the University recommends that students not living at home reside in University housing, but the decision is up to the student. Arrangements for off-campus housing are the responsibility of students and their families. Students who live within commuting distance of the campus should be sure about their housing plans for the year before signing the residence license agreement.

Most rooms accommodate two students; however, three- and four-person rooms are available. Some residence halls offer suites for two to seven students. All suites have one to three bedrooms and a bathroom; some have a common area. Suites are reserved for residents participating in one of the theme housing programs.

The University maintains some upperclass apartment units that accommodate up to four students. Each unit is fully furnished; the rental charge includes utilities. Assignments for freshmen and first quarter transfer students are based on the roommate compatibility survey. Upperclass assignments are based on the date of receipt of the housing deposit and application. The residence application and housing deposit must be returned promptly.

■ **Housing Applications and License Agreement**

Housing applications and residence license agreements are administered by the Department of Residential Life. Housing is subject to available space. Students who have been accepted by the University will receive a housing packet containing important residence application and deposit information.

To complete the housing application process, freshmen and transfer students must return the housing application to the Department of Residential Life and the deposit

card with a \$400 room deposit to the Cashier's Office. The nonrefundable and nontransferrable housing deposits are credited toward the last quarter of the first year residence charges.

The residence license agreement for freshmen is for three full quarters of the year. The license agreement for freshmen with partial credit is also for three full quarters. The license agreement for transfer students is for one quarter at a time. All students are assigned on a first-come, first-served basis.

■ **Costs for Room per Quarter***

All single rooms are charged at an additional rate of \$150 per quarter. Returning upperclass students must apply for housing each quarter. The upperclass housing deposit is \$75 per quarter. See pages 27–28 for other residence-related fees.

Traditional Residence Halls

Kerr Hall	\$1,160
Light Hall	\$1,160
Melvin Hall	\$1,160
Smith Hall	\$1,160
Speare Hall	\$1,160
Stetson Hall East	\$1,160
Stetson Hall West	\$1,160
White Hall	\$1,160
Northeastern at the Y	\$1,025

Suites

Kennedy Hall (115–119 Hemenway Street)	\$1,160
153 Hemenway Street	\$1,160
157–163 Hemenway Street	\$1,160

Apartments

Burstein Hall, 458 Huntington Avenue	\$1,270
Fairwood, 319 Huntington Avenue	\$1,160
337 Huntington Avenue	\$1,270
407 Huntington Avenue	\$1,270
Rubenstein Hall, 464 Huntington Avenue	\$1,270
106–122 St. Stephen Street	\$1,270
Willis Hall, 50 Leon Street	\$1,365

*The foregoing quarterly rates are for the 1991–92 academic year only. Costs and types of residence halls (coed, male, female) are subject to revision by the President and Board of Trustees at any time. The resident composition of any building may be adjusted at any time based on changes in the demographics of the student population.

■ **University Dining Service**

All students who live in traditional University residence halls and suites are required to participate in the food plan run by the University Dining Service. At the beginning of the first quarter, all entering freshmen residing in University residence halls will be billed for the 19-meals-per-week option. Once you have had an opportunity to determine your eating habits, you may decide to select the 15- or 10-meal per week option.

Meals per Week	Cost per Quarter*
19	\$1,045
15	\$945
10	\$860
5	\$415 upperclass only

*The foregoing quarterly rates are for the 1991–92 academic year only. Dining plan costs are subject to change at any time.

Dining Plus This plan allows board plan participants to deposit money into an account and then to use their meal card to purchase meals or snacks at any of the retail dining facilities on campus.

Note Students in University apartments are not required to be on the food plan, but they may choose one of the meal plans if they wish. When conditions warrant, the University may close or consolidate certain dining facilities.

■ Orientation

The Student Orientation Staff is a group of upperclass students who provide incoming freshmen with a comprehensive orientation to the university. Members of this group greet new resident students and help them move into halls. Orientation includes educational and social programs that give new residential and commuting students the opportunity to learn more about the University and to relax and have fun as they begin their studies at Northeastern.

■ Residence Hall Staff

The residence community is divided into three campus areas, each of which is directed by an area coordinator who represents the residential life administration in all student personnel and housing matters. Each residence hall within an area is staffed by a residence director, graduate assistant, or resident assistant who maintains close contact with the students in the hall and serves as its administrator.

■ Residence Hall Proctors

Residence hall proctors are stationed at the entrance of most residence halls. Proctors make reasonable efforts to ensure that only residents and their guests are admitted to the building.

■ Residence Hall Security

While the Department of Residential Life tries to provide pleasant and safe residence halls, it reminds students that each individual who lives, works, or studies in an urban environment has a responsibility to observe courtesy to neighbors, basic personal safety, and security practices. The Department of Residential Life realizes the extra demands for personal safety imposed by urban life. It maintains constant vigilance: residence halls are locked 24 hours a day, entrances are monitored, and proctors ensure that only residents and their guests gain admission. The proper authorities are notified if unauthorized persons attempt to gain access. The University urges students to recognize the seriousness of abiding by security policies and practices. (See also the Public Safety Division section, page 199.)

■ Residence Hall Closings

Residence halls are officially closed during intersession periods between quarters. During these periods, students are expected to vacate their rooms.

■ Residence Hall Policies

For policies, rules, and regulations regarding residence hall living, please refer to the *Student Handbook* and *A Guide to Residence Hall Living*.

■ Married Student Housing

At this time, the University does not provide married student housing.

■ **Sports Facilities**

The University has two outdoor facilities—basketball courts and volleyball courts—where resident students may participate in sports activities.

■ **Escort Service**

The Division of Public Safety provides an escort service, which is available to all members of the University. The service operates 24 hours a day, every day of the year, and provides escorts to any location on campus.

■ **Cars on Campus**

Resident students are eligible to purchase a day student parking sticker which will allow parking in all student-designated lots between 7:00 A.M. and 11:00 P.M. Resident students who only wish to park overnight (8:30 P.M.–6:00 A.M.) Monday through Friday, must obtain a Quarterly Student Parking Pass through the Traffic Office. The pass is available at no charge and must be displayed on the vehicle's dashboard. For further information, contact the Office of Traffic Services, 124 Forsyth Building.

■ **Bicycles**

Bicycle racks are provided at various locations on campus for use by students. Bicycles may not be chained to fences, doors, trees, or other objects. Under no circumstances may bicycles be brought into any school building.

■ **Guided Tours**

Arrangements for tours of the Northeastern campus, including residence halls, may be made by telephoning the Department of Undergraduate Admissions at 617-437-2211. See page 8.

Academic Policies

■ **The Academic Year**

Northeastern University operates on a quarter-system calendar.

■ **Quarter-Hour Credits**

All courses are evaluated in terms of quarter-hour credit. A quarter-hour credit is equal to three-fourths of a semester-hour credit. Classes at Northeastern are scheduled in different modules.

In assessing quarter-hour weights for courses, the following statement applies:
One quarter hour of credit is three hours of student learning time per week, usually one hour of lecture or discussion plus two hours of individual study time, over a quarter.

■ **Grades**

A student's grade is officially recorded by letter. An official University grade report is mailed to each student at the end of each quarter. An incomplete (I) grade indicates that the student has not completed the course requirements. The following grades, listed with their numerical equivalents, are used:

A	4.000	C	2.000
A-	3.667	C-	1.667
B+	3.333	D+	1.333
B	3.000	D	1.000
B-	2.667	D-	0.667
C+	2.333	F	0

■ **Examinations**

Examinations covering the work of the quarter usually are held at the close of each quarter. Exceptions may be made in certain courses where, in the opinion of the instructor and with the approval of the dean of the college concerned, final examinations are not necessary.

Freshmen who are taking a full academic program and who have a weighted average for the year below 1.4 will not be permitted to register for advanced work. Upperclass students should consult the *Student Handbook* to ascertain the level of continuing achievement required of them by the faculty of their college.

■ **Pass/Fail System**

Students may register for a limited number of courses on a pass/fail basis. Each college has its own rules governing this system. Pass/fail grades are not included in the calculation of the quality-point average. Only pass grades earn credits toward degree requirements. (Pass/fail guidelines are also stated in the *Student Handbook*.)

■ **Dean's List**

At the end of each quarter a Dean's List is issued containing the names of students who have a 3.250 quality-point average or higher, with no incomplete grade or grade below C-. Students on any form of probation, enrolled in a course on a pass/fail basis (except where there is no alternative or where required by the program), or not carrying a full load as determined by their Basic College, are not eligible. With few exceptions, a full load is considered to be four courses or 16 quarter hours.

■ **Graduation with Honors**

At graduation, Northeastern bestows honors on students who exemplify outstanding academic achievement. Students graduating with honors must have completed a minimum of six full-time quarters. Upon special vote of the faculty, honors are conferred based on the following criteria:

Quality-Point Average	Honor Conferred
3.25–3.49	Honors—Cum laude
3.50–3.74	High honors—Magna cum laude
3.75–4.00	Highest honors—Summa cum laude

■ **Changes of Program**

The University reserves the right to withdraw, modify, augment, or change the order or content of courses in any curriculum. It further reserves the right to change tuition, fees charged, and other regulations.

Any changes that may be made from time to time pursuant to the above policy shall be applicable to all students in the school, college, or department concerned, including former students who may re-enroll.

■ **Reports on Scholastic Standing**

Reports are issued after each grading period. Questions about grades are to be discussed with the student's faculty adviser. Parents and students may confer with college officers and faculty advisers on this and other relevant academic matters.

■ **Transcripts**

Applications for transcripts of record are made at the Office of the Registrar, 117 Hayden Hall. A fee of \$2 is charged for each transcript request.

■ **Middler-Year Writing Requirement**

All students must successfully complete the Middler-Year Writing Requirement.

- The Middler-Year Writing Requirement must be fulfilled for graduation with a bachelor's degree. A prerequisite for the Middler-Year Writing Requirement is the successful completion of Freshman English (or equivalent).
- The Middler-Year Writing Requirement may be fulfilled after the student has successfully completed at least 80 quarter hours of academic work (including transfer credit) and before completing 144 quarter hours. The requirement must be fulfilled at Northeastern.
- As determined by each college, the Middler-Year Writing Requirement may be fulfilled by passing one designated, upper-division four quarter hour writing course with a grade of C (2.0) or better or by passing a one quarter hour writing course (Writing Workshop) pass/fail for designated majors, or by petition for all others. Upperclass students should consult their college adviser or Middler-Year Writing Requirement Office in the Department of English to see which option applies to them.

The *Undergraduate School Course Description and Curriculum Guide* and the *Student Handbook* specify the details of the writing requirement for both entering freshmen and transfer students.

■ **Attendance**

Students are expected to attend all meetings of their classes. Absence from regularly scheduled classes may seriously affect the standing of the student and result in the University's dropping the subject or subjects from the student's schedule. Laboratory work can be made up only during hours of regularly scheduled instruction.

■ General Conduct

It is assumed that students come to the University for a serious purpose. The University community expects each student to respect the rights and privileges of others and to adhere to acceptable standards of personal conduct. Students should exercise their freedom with maturity and responsibility. They are expected to obey University regulations and to follow the instructions of and pay due respect to University officials. Conduct inconsistent with the general order of the University may result in disciplinary action. Damage to any building or to any of the furniture, apparatus, or other property of the University will be charged to students involved.

Any form of academic dishonesty is regarded as a most serious offense and renders the offender liable to disciplinary action. Aiding and abetting a student in any dishonesty is also held to be a grave breach of discipline.

The University administers discipline with a high standard of integrity and a scrupulous regard for truth.

Academic Programs

College of Arts and Sciences



Robert P. Lowndes, Ph.D., *Dean*

Ronald J. McAllister, Ph.D., *Associate Dean, Academic Affairs*

Kay D. Onan, Ph.D., *Associate Dean, Faculty Affairs*

Mary Mello, M.A., *Director, Academic Administrative Services*

Marva Perry, M.Ed., *Assistant Dean, Minority Affairs*

Charles J. Haberle, M.S., *Coordinator, Undergraduate Student Services*

Gail F. Leclerc, M.Ed., *Counselor to Undergraduates*

Joseph O. Monahan, M.A., *Coordinator, International Study Programs*

A broad study of disciplines in the arts and sciences is the core of higher education. Most students in the University—no matter what career training they choose—devote a substantial portion of their studies to the arts and sciences.

The College of Arts and Sciences comprises programs grouped informally into the following areas: performing and visual arts, humanities, sciences and mathematics, and social sciences. The college as a whole emphasizes general education through

the college core curriculum. In addition, a large number of interdisciplinary and extradisciplinary programs are available. These include national and international exchange programs for employment and/or study; programs in field settings at sea and abroad; and cultural programs involving affiliations with professional performing arts organizations. These programs are described at the end of this section (see pages 79–87).

Graduates find they are prepared for a variety of employment opportunities. Many accept employment after receipt of the bachelor's degree. Others go on to graduate-level studies. Some pursue advanced study in areas related to their undergraduate field.

Four- and Five-Year Programs In all programs, students may choose a four-year, full-time track or the five-year Cooperative Plan of Education. The Five-Year Plan offers opportunities for paid employment, often in an area related to the student's chosen academic area. Students are normally eligible to participate in the Cooperative Plan of Education when they become sophomores.

■ Major Programs

Freshmen may declare a major prior to their matriculation. Students who enter as freshmen with no specified major (liberal arts major preference, referred to as LAMP) must declare a major by the end of the freshman year. Considerable flexibility exists, and many students change majors during the first two years.

The college offers a bachelor of arts degree and a bachelor of science degree in most programs. Students majoring in human services may earn a bachelor of arts degree only. Those majoring in art and architecture with a concentration in architecture or in visual and media design, in applied physics, or in political science with a concentration in public administration may earn only a bachelor of science degree.

In general, the bachelor of arts degree requires more college core curriculum courses as well as a foreign language. The bachelor of science degree requires fewer core curriculum courses but more work in the specific major.

■ Double Majors

Many programs are flexible enough to allow students to pursue a double major. To do so, students must complete requirements for both majors.

■ Honors Program See pages 19–20.

■ Honor Societies The Academy, Phi Alpha Theta (history), Phi Kappa Phi, Phi Sigma (biology), Pi Sigma Alpha (political science), Sigma Pi Sigma (physics)—see page 203.

■ Graduation Requirements

Quantitative All degree candidates must successfully complete a minimum of 176 quarter hours of credit. Only four quarter hours of physical education credits and no ROTC credits may be used to meet degree requirements.

Residency Candidates must complete either 75 percent of their degree credits or the last three full quarters (minimum 12 full courses) in Northeastern's day school.

Qualitative A minimum cumulative average of C (2.0) is required for graduation.

Transfer Credit Transfer credit is granted initially only for Arts and Sciences courses comparable to courses given in Northeastern University's Basic Day Colleges. In the first quarter in residence, students may petition for additional transfer credit. No

transfer credit will be granted for courses in which the student received lower than a C (2.0) grade or for courses in which a pass/fail grade was received. For courses in progress at the time of a transfer student's application, an updated transcript showing grades must be submitted in order for transfer credit to be granted. For more information, see the Transfer Students section, page 14.

Freshman English All degree candidates must complete two quarters of Freshman English at Northeastern. Students who need extra assistance in writing skills may have to take three quarters of Freshman English.

Middler-Year Writing Requirement All students must fulfill an upper-division writing requirement. This is normally done after successful completion of 80 quarter hours (middler year for co-op students or junior year for non-co-op students). Students should check with the Middler Year Writing Office or the Office of the Dean of Arts and Sciences for details on options available for meeting this requirement.

Mathematics Requirement All freshmen will take a mathematics placement test prior to the start of classes. Students must complete basic coursework and prove proficiency in college-level mathematics. This is normally done during the freshman year. Refer to the College of Arts and Sciences *Student Guidebook* for details.

Major Degree candidates must successfully complete the courses specified as major requirements. A complete listing of these required courses is published in the *Basic Day Colleges Course Descriptions and Curriculum Guide*.

College Core Curriculum All students must complete the college core curriculum by taking courses in basic skills, both communicative and quantitative; methods of inquiry; Western cultural heritage; alternative cultures and societies; theoretical perspectives and changes; and current issues in perspective. Details on the core curriculum are provided to students upon entry and are also published in the Arts and Sciences *Student Guidebook* available in the College of Arts and Sciences Dean's Office.

Foreign Language All bachelor of arts degree candidates must show proficiency in a modern foreign language by earning a passing grade in intermediate-level II of a college course or by meeting a comparable criterion approved by the Department of Modern Languages.

Conditional exemption from this requirement may be granted to students who earned an average of C or better in a full, four-year language sequence in secondary school or to students who earned an average grade of A in a three-year language sequence in secondary school. A conditional exemption must be confirmed by taking a proficiency examination during the first quarter at the University. A sufficiently high score will verify the exemption; otherwise, the student will be advised of the appropriate language course to take in the following quarter.

Absolute exemption is granted to students for whom English is a foreign language or who receive a score of 550 or better in the Language Achievement Examinations.

The normal sequence for students with no prior preparation is two quarters of elementary-level language and two quarters of intermediate-level language. The Department of Modern Languages will determine an appropriate entry point at which students who have partial language preparation may begin completing the requirement. Students who plan to use Russian or Italian to fulfill the foreign language requirement should begin study as early as possible. The college is not able to offer these courses on a regular basis.

- **Graduation with Honors** See page 41.

■ Advising and Placement

Upon acceptance to the college, students are assigned a faculty adviser in their major department or, for students who are unsure about a major, a specially assigned liberal arts major preference (LAMP) adviser. LAMP advisers work to help freshmen determine areas of interest and choose a major by the end of the freshman year. With this adviser, students choose courses that suit their interests and abilities and the requirements of their major.

When necessary, students may undertake studies in skill development to improve their chances of success in college. Continual monitoring and mentoring by faculty advisers is provided throughout the undergraduate years.

The Arts and Sciences Dean's Office is the central administrative office for students majoring in arts and sciences programs. Dean's Office counselors work closely with faculty advisers to help students plan study programs and to handle administrative problems. The Dean's Office at 400 Meserve Hall is open from 8:30 A.M. to 4:30 P.M., Monday through Friday, during the fall, winter, and spring quarters, and from 8:00 A.M. to 5:30 P.M., Monday through Thursday, during the summer.

■ Student Services

The Math Center Instructional assistants offer free one-on-one help in clarifying concepts, explaining methods, and checking homework. Center hours are Monday through Friday, 9:00 A.M. to 4:00 P.M. Students in algebra review courses and introductory math courses may make appointments at 102 Cahners Hall. Advanced-course students may drop in on Tuesdays and Thursdays.

The Writing Center Trained tutors offer free assistance with assignments or other writing tasks. Center hours are Monday through Thursday, 10:00 A.M. to 4:00 P.M. and some evening hours. Students may drop in at 102 Cahners Hall or telephone 617-437-3086 for an appointment. Students should bring their writings with them.

■ Graduate Education

For information on graduate degrees, see page 182.

■ Combined Program with Professional Schools

Under this program, a preprofessional student may reduce by one year the time normally required for obtaining both the undergraduate and professional degrees. Students who have completed at least three-fourths of the work required for a baccalaureate degree in the College of Arts and Sciences and who are accepted into an approved professional school of dentistry, law, medicine, optometry, osteopathy, or veterinary medicine will be eligible for the B.A. or B.S. degree at the end of their second year in a professional school. At least two-thirds of the work for the baccalaureate degree must be earned in residence at Northeastern, and all other College of Arts and Sciences requirements must be fulfilled, the residence requirement having been completed prior to entrance into the professional school.

■ Program Descriptions and Regulations

The following pages briefly describe each major in the College of Arts and Sciences. Within each area of the college, the majors are listed in alphabetical order. Summaries of the areas can be found on the following pages: Performing and Visual Arts, page 48; Humanities, page 51; Sciences and Mathematics, page 57; Social Sciences, page 66.

A summary of the special programs in the college begins on page 79. A complete listing of individual courses, including a short description of contents for each course, is given in the *Basic Day Colleges Course Descriptions and Curriculum Guide*, available from the Office of the Registrar.

Performing and Visual Arts

The arts are fields that combine knowledge and skill. A distinction is often drawn between performing arts—music and dramatic art—and fine arts—painting, drawing, sculpture, and architecture. The performing and visual arts at Northeastern comprise the departments of art and architecture, music, and theatre.

All branches of the arts are being affected by changes in technology. Today the arts include not only fine arts and performing arts, but also computer graphics, environmental design, and other forms of visual communication.

The performing and visual arts area incorporates arts programs and services, a community arts department, and several artists-in-residence groups.

Department of Art and Architecture

Peter Serenyi, Ph.D., *Professor and Chairman*

<i>Professor</i>	<i>Assistant Professors</i>	Christopher D. Ferrier, M.F.A.
Mardges Bacon, Ph.D.	Edwin C. Andrews, M.F.A.	Geoffrey Fried, M.F.A.
<i>Associate Professors</i>	Mary Ann Frye, M.F.A.	Patrick Hickox, M.Arch.
Samuel S. Bishop, M.F.A.	Dianne W. Pitman, Ph.D.	Barry B. O'Brien, M.S.
Mira Cantor, M.F.A.	<i>Lecturers</i>	Pamela A. Patton, M.A.
T. Neal Rantoul, M.F.A.	Joan Bowker, M.A.	Thomas J. Petit, M.F.A.
	Judith Brassard Brown,	Victoria L. Putz, M.F.A.
	M.F.A.	Thomas M. Sieniewicz,
	Rico Cedro, M.Arch.	M.Arch.

Degrees Offered: Bachelor of Arts, Bachelor of Science,
Bachelor of Science with a concentration in Visual and Media Design

The visual arts are our oldest form of artistic expression. The use and understanding of visual language increasingly is a necessary part of contemporary education.

The aims of the department are to

- introduce art and architecture both as history and as creative activity;
- offer a focused study of the visual arts through critical examination of both the language and content of art and architecture in the context of a particular historical period, or through the hands-on experience of a studio setting;
- offer a solid academic foundation for a career in art and architecture or related fields.

A main resource of the department is Boston itself. The city's architecture spans 300 years, its museums are world famous, its galleries and cinemas offer the latest in their respective areas, and its public library is one of the best of its kind. Teaching students to use these resources systematically is an all-embracing aim of the department.

■ Professional Preparation

The department offers preprofessional preparation for students interested in pursuing a career in architecture, graphic design, photography, and the teaching of the history and practice of art. Cooperative education work assignments for majors include positions in museums, libraries, historical collections, archives, architectural firms, and design firms.

■ **The Major**

The department offers a general major in art and concentrations in architecture and visual and media design.

Departmental requirements for the major in art are a two-part survey course in art history, a two-part visual foundations course, a drawing course, and 12 electives in art and/or architecture plus the core curriculum. With prior approval, courses may be taken in one of the neighboring art schools or universities.

Architecture This concentration leads to a bachelor of science degree, not a professional degree in architecture. The requirements are similar to the art major, except that the 12 art electives are replaced by 4 architectural history courses, 6 architectural design courses, 2 art or architecture studio electives, 3 technical courses, 2 computer-aided design courses, and 4 math/science courses. Students must begin to take the required courses in the freshman year.

Visual and Media Design In this concentration the 12 art electives required for the general art major are replaced by 16 studio courses, 2 history of art courses, 1 speech communication course, and 2 business courses. To fulfill all requirements, students must begin to take required courses in the freshman year.

■ **The Minor**

The minor program consists of a general minor and the following concentrations: history of art and architecture, graphic design, photography, and studio art. Students interested in the minor program should consult the department chair.

■ **Related Programs**

See Center for Asian Studies (page 187); see also Cinema Studies Minor, International Programs, Media Studies Minor, Performing and Visual Arts, and Teacher Preparation Option in the Special Programs section, which begins on page 79.

Department of Music

Joshua R. Jacobson, D.M.A., *Professor and Chairman*

<i>Professors</i>	David D. Sonnenschein, D.M.A.	Virginia Eskin, B.A.
Reginald W. Haché, Art. Dip.	Judith Tick, Ph.D.	Leon C. Janikian, M.M.
Roland L. Nadeau, M.M.		Karen L. Pokross, Ed.M.
<i>Associate Professors</i>	<i>Assistant Professor</i>	Jeanne M. Segal, M.M.
Julia A. Griffin, Ph.D.	Leonard L. Brown, Ph.D.	John K. Tyson, B.M.
William Lowe, M.A.	<i>Lecturers</i>	Shiela Waxman, D.M.A.
Dennis H. Miller, D.M.A.	Marjorie J. Atlas, M.M.	<i>Visiting Faculty</i>
	Steven Cornelius, Ph.D.	Allen G. Feinstein, M.M.
	Douglas F. Durant, Ph.D.	Phillip Terrell, M.M.

Degrees Offered: Bachelor of Arts, Bachelor of Science;
Bachelor of Arts or Bachelor of Science with a concentration in Music Industry

The primary aim of the department is to foster an appreciation of music by enabling students to understand and intelligently evaluate musical compositions.

Courses are offered in general appreciation, music theory, the history of music (both Western and non-Western), applied music lessons, and the music industry. Performing ensembles provide the opportunity for first-hand experience with music studied in the classroom. An extensive concert series offers a variety of performances by faculty, students, and guest artists. Hands-on musical training is reinforced by a piano laboratory, an electronic music laboratory, and a listening center.

■ **Professional Preparation**

A major in music enables students to prepare for a wide range of professions, including performance, teaching, church music, arts administration, composition, music therapy, broadcasting, and studio production.

■ **The Major**

The degree program offers a broadly based curriculum that allows students to concentrate in music while acquiring a comprehensive education in the humanities and sciences.

Music Literature This concentration focuses on the analysis of music from theoretical and historical perspectives. Students must complete seven courses in music theory, ear-training, and analysis; five courses in music history; one course in keyboard proficiency; two courses in art and theatre; and eight ensemble credits. Remaining coursework is selected from a broad base of electives and the college core curriculum.

Music Industry This concentration combines analysis of music with courses on various aspects of the music business. Students must complete four courses in music theory, ear-training, and analysis; two courses in music history; one course in keyboard proficiency; seven courses in the music industry; eight courses in business; one course in related arts; and four ensemble credits. Remaining coursework is selected from a broad base of electives and the college core curriculum.

Music Literature and Performance This concentration combines scholarly work with advanced instrumental instruction. Students must complete six courses in music theory, ear-training, and analysis; four courses in music history; one course in keyboard proficiency; six courses in private instruction; two courses in art and theatre; and eight ensemble credits. Remaining coursework is selected from a broad base of electives and the college core curriculum.

■ **The Minor**

The minor consists of three courses in music theory, two courses in music history, one course in keyboard proficiency, and one elective in music. A theatre minor with an emphasis in music theatre is also available.

■ **Related Programs**

See theatre minor with emphasis on music theatre on page 51; International Programs, League of Composers, New England Composers Orchestra, New England Conservatory Affiliation, Performing and Visual Arts, and Teacher Preparation Option in the Special Programs section, which begins on page 79, and *Essays on Modern Music* in the section on journals, which begins on page 87.

Department of Theatre

Del E. Lewis, M.F.A., *Associate Professor and Chairman*

Professor

Mort S. Kaplan, M.A.

Associate Professors

Janet L. Bobcean, M.F.A.

Jerrold A. Phillips, Ph.D.

Assistant Professor

Nancy Kindelan, Ph.D.

Degrees Offered: Bachelor of Arts, Bachelor of Science

Theatre is a moving force in our society because it involves both the performer and the spectator in a manner unlike other creative and communicative arts.

■ Professional Preparation

The Department of Theatre offers a program that provides a balance between theory/history/literature courses and studio rehearsal and performance work. The program provides the background for advanced study on a graduate level or for a career in the professional theatre.

■ The Major

The program is designed to help students understand the essentials necessary as a foundation on which to elect one of the following concentrations: acting/directing or technical/design.

The classroom and stages are the laboratories where theory is tested. Theatre majors are encouraged to express creative and interpretative impulses and, with the support of a faculty adviser, are often able to perform a variety of projects of their own initiation in acting, directing, playwriting, design, or performance art.

In addition to completing the courses required by the college, majors in all concentrations must complete 48 quarter hours of the departmental core, which includes such courses as Introduction to Acting, Concepts of Directing, Stagecraft, Introduction to Theatre Design, and Introduction to Theatre Arts.

All theatre majors are expected to work in production each quarter they are in residence and to fulfill a variety of crew assignments in construction, painting, sound, lighting, costuming, and box-office work, as well as crew assignments for the running of a show. Whenever possible, majors are expected to serve as stage managers and assistant stage managers. Appearing in a production is not a substitute for crew work.

Theatre majors must maintain a regimen of physical conditioning while in residence. The following courses, when available, are recommended: Modern Dance, Ballet, Jazz Dance, Tumbling, Gymnastics, Fencing, and Physical Conditioning.

■ The Minor

The theatre minor requires eight theatre courses (32 quarter hours). Supervised by a departmental adviser, students take seven core courses and one required elective. Music majors can minor in theatre with an emphasis on music theatre.

■ Related Programs

See American Sign Language Programs, Cinema Studies Minor, International Programs, Irish Studies Program, Performing and Visual Arts, and Teacher Preparation Option in the Special Programs section, which begins on page 79.

Humanities

The humanities address and exemplify basic questions that confront every generation: the nature of truth, knowledge, and beauty. The ideas, texts, and traditions that have shaped us are their unifying materials. At Northeastern the humanities comprise English, journalism, modern languages, philosophy and religion, and speech communication.

Humanities departments are related not only by their exploration of common areas of knowledge but, more importantly, by their reliance on such analytical processes as careful reading and critical thinking. Thus, civilization is understood and the humanities are preserved.

Department of English

Stuart S. Peterfreund, Ph.D., *Associate Professor and Chairman*

Professors

Samuel J. Bernstein, Ph.D.
Robert J. Blanch, Ph.D.
Francis C. Blessington, Ph.D.
Irene Fairley, Ph.D.
Gary Goshgarian, Ph.D.
Earl N. Harbert, Ph.D.
James E. Nagel, Ph.D.
Kinley E. Roby, Ph.D.
Guy Rotella, Ph.D.
Michael Ryan, Ph.D.
Herbert L. Sussman, Ph.D.
Arthur J. Weitzman, Ph.D.
Joseph E. Westlund, Ph.D.

Associate Professors

Timothy R. Donovan, Ph.D.
Maryemma Graham, Ph.D.
Gerald R. Griffin, Ph.D.
Janet Randall, Ph.D.
Kristin Woolever, Ph.D.

Assistant Professors

Kathy Howlett, Ph.D.
Nicholas Humy, Ph.D.
Kathleen Kelly, Ph.D.
Marina Leslie, Ph.D.
Mary K. Loeffelholz, Ph.D.
Linda Loehr, Ph.D.

Joyce H. Scott, Ed.D.
Henrietta N. Shirk, Ph.D.
Charles H. Sides, Ph.D.
Susan Wall, Ph.D.

Instructors

Joseph deRoche, M.F.A.
David Tutein, M.A.

Continuing Lecturers

Ken Capobianco, M.A.
Randy Garber, M.A.
Claire E. Knox, M.A.
Bradley Smith, M.A.
Marion Van Nostrand, M.A.

Degrees Offered: Bachelor of Arts, Bachelor of Science

The Department of English curriculum offers courses in creative, expository, and technical writing; linguistics; literary studies; and American and British literature.

Mastery of the written word is an essential survival tool. The study of language and literature provides insight into the world's complexity and helps give shape and meaning to life experiences. Language is the symbolic structure that contains us, defines us, and from which we create ourselves. To study language in its various forms is to study what it is to be human.

■ Professional Preparation

The curriculum enables students who major in English to prepare for careers in teaching and research, advertising and publishing, radio and television—indeed, any field in which communication and judgment go hand in hand. The department also offers a broad intellectual and cultural framework for preprofessional students—in law, medicine, business, engineering, or computer science.

■ The Major

After completing the freshman requirement, the English major takes survey courses, area courses (in language or writing, British literature, American literature, major figures, genres), other electives, and a senior seminar. Students may study science fiction, African-American literature, topics in film, or children's literature as well as Shakespeare, early American literature, Romantic poetry, and topics in literary criticism. Independent study may be arranged by consulting with an instructor.

Members of the department are available to advise students. The major figure requirement, for example, may be met by successfully completing courses from among such offerings as Edgar Allan Poe, Ernest Hemingway, and Jane Austen, as well as Chaucer and Milton. The department regularly adds new courses to this area.

■ The Minor

Students who minor in English may concentrate in literature, writing, linguistics, or technical communication to supplement the major concerns of other disciplines. Interdisciplinary minors in linguistics and in technical communication are described in the Special Programs section, which begins on page 79. Within each minor, the student may select an individual course of study with the help of a faculty adviser.

■ **Related Programs**

See Cinema Studies Minor, International Programs, Irish Studies Program, Linguistics Minor, Media Studies Minor, Teacher Preparation Option, Technical Communication Minor, and Women's Studies Minor in the Special Programs section, which begins on page 79. See also *Nineteenth-Century Contexts*, *Studies in American Fiction*, and *The Scriblerian* in the section on journals, page 87.

Department of Modern Languages

Holbrook C. Robinson, Ph.D., *Associate Professor and Chairman*

<i>Professor</i>	Inez Hedges, Ph.D.	Ross D. Hall, Ph.D.
Constance H. Rose, Ph.D.	Neil A. Larsen, Ph.D.	Robert B. Modee, M.A.,
	Bonnie S. McSorley, Ph.D.	<i>Executive Officer</i>
<i>Associate Professors</i>	Stephen A. Sadow, Ph.D.	
Lillian Bulwa, Ph.D.	John Spiegel, Ph.D.	<i>Instructors</i>
Walter M. Gershuny, Ph.D.		Anthony P. Esposito, M.A.
Juliette M. Gilman, Ph.D.	<i>Assistant Professors</i>	Rita Schneider, M.A.
	Deborah Arteaga, Ph.D.	

Degrees Offered: Bachelor of Arts, Bachelor of Science

The study of modern languages can benefit all students, regardless of their major fields of interest. In the complex modern world, increased communication among varied and often divergent cultures is critical. It is important to understand and appreciate how the members of different cultures think. Language offers the key to understanding and may serve to help one achieve a more cosmopolitan, open-minded, and sensitive view of the world.

■ **Professional Preparation**

The department offers background preparation to students interested in elementary school, secondary school, or college teaching; international business relations; high-tech fields; government service; journalism; library science; world affairs; travel; and community service, especially in Spanish-speaking areas. (Those who wish to teach in college must plan on graduate study.)

■ **The Major**

Available in French, German, Italian, Russian, or Spanish, the major in modern languages normally requires advanced courses in two languages. The freshman year should be used to fulfill as many general requirements as possible and to begin study of the first, principal language. Students planning to study Russian or Italian should begin courses as early as possible; these courses are not offered on a regular basis.

Normally, the study of a second language begins in the second year. Students should take at least two language electives per quarter from the beginning of the second year. This pattern may be varied to fit the needs of the individual student.

The first and second language requirements are *minimum* requirements. Students are strongly encouraged to go beyond them, and even to pursue a third language.

The department is currently designing a one-language major. Students are urged to consult their department advisers for more information concerning this program and other possible curriculum changes.

The bachelor of arts is the principal degree offered. A bachelor of science is offered in French and Spanish. For either, the student must select a primary as well as a secondary language from appropriate departmental offerings.

Candidates for the B.A. must satisfy the college requirements for graduation and meet the departmental requirements in their major: 16 quarter hours in history (any history courses relevant to the major are acceptable), 8 quarter hours of Survey of English Literature, a minimum of 32 quarter hours of advanced work in the primary language, and 8 quarter hours of advanced work in the secondary language. Advanced work may be defined as any course beyond the intermediate level of the language.

Candidates for the B.S. degree must complete 8 quarter hours of composition and conversation in the first and second languages, 40 additional quarter hours of advanced work in the primary language, and 16 additional quarter credits of advanced work in the secondary one.

■ **The Minor**

For students interested in acquiring proficiency in one foreign language as an adjunct to their major, the department offers a minor in modern languages, open to students of all colleges. The details of the requirements for a minor vary slightly from language to language, but in all cases the student is required to take a total of six courses. Generally, two composition and conversation courses, a civilization course, and an introductory course in literature are required. The remaining courses are free electives drawn from advanced courses offered by the department. Students are urged to consult the department adviser for more information about the minor.

■ **Facilities**

In the basic language courses, two half-hour sessions per week in the language laboratory are required. The language laboratory is available on an optional basis for advanced work. The department lounge is available to Modern Language students.

■ **Related Programs**

See American Sign Language Programs, Elementary Spanish Course for Criminal Justice and Human Services Majors, International Programs, Linguistics Minor, Russian Studies Minor, and Teacher Preparation Option in the Special Programs section, which begins on page 79.

Department of Philosophy and Religion

Susan M. Setta, Ph.D., *Associate Professor and Chairman*

Professors

Walter L. Fogg, Ph.D.
Pavel Kovaly, Ph.D., C.Sc.
Stephen L. Nathanson, Ph.D.

Associate Professors

William J. DeAngelis, Ph.D.
Bart K. Gruzalski, Ph.D.
Edward A. Hacker, Ph.D.
Michael Lipton, Ph.D.

Gordon E. Pruett, Ph.D.

Joseph H. Wellbank, Ph.D.

Lecturer

Michael C. Meyer, Ph.D.

Degrees Offered: Bachelor of Arts, Bachelor of Science

Philosophy includes questions and theories related to art, religion, morality, society, and natural and social sciences. The study of philosophy challenges students to examine their beliefs in many areas through critical reflection.

Through readings, discussion, and writing, students examine questions concerning the nature and validity of religious beliefs, moral judgments, and scientific theories, as well as questions of values and social policy in such areas as law, medicine, and technology.

■ Professional Preparation

Courses may help strengthen the student's work in other areas and provide an understanding of the methods and traditions of philosophical and religious thought. A major in philosophy may help students sharpen their critical abilities in preparation for graduate or professional study. Former philosophy majors can be found in the most diverse of professional careers.

■ The Major

The philosophy major offers students a balanced understanding of the nature of philosophy and particular philosophical problems that arise in the various arts and sciences.

All degree candidates must take at least 8 quarter hours in English and 52 quarter hours in the department and must meet the following specific requirements:

- Classical Greek Philosophy and Modern Philosophy;
- Introduction to Logic or Symbolic Logic (the department urges students contemplating graduate studies in philosophy to take Symbolic Logic);
- Theory of Knowledge or Metaphysics or Moral Philosophy;
- at least one seminar;
- 32 quarter hours of philosophy electives, selected in consultation with a departmental adviser.

■ Religion Program

The program in religion enables students to acquire an understanding of religious experience, both as an individual response and within its social, historical, literary, and political context. Specific religions are studied, as are the mythical and mystical dimensions of religious experience in general. Although a major is not offered in religion, the program offers a basic introduction to religious studies through introductory and intermediate-level courses.

■ The Minor

The minor in philosophy consists of 28 quarter hours. Specific requirements are as follows:

- an introduction to philosophy course;
- either Classical Greek Philosophy or Modern Philosophy;
- either Introductory Logic or Symbolic Logic;
- Moral Philosophy, Theory of Knowledge, Metaphysics, or Philosophy of Mind;
- three electives in philosophy.

■ Related Programs

See International Programs, Linguistics Minor, Teacher Preparation Option, and Women's Studies Minor in the Special Programs section, which begins on page 79.

Department of Speech Communication

Richard A. Katula, Ph.D., <i>Professor and Chairman</i>		
<i>Associate Professors</i>	<i>Assistant Professors</i>	Meg Crohan, M.S.
Karen S. Buzzard, Ph.D.	Simon Jones, Ph.D.	David Knapp, M.S.
Carl W. Eastman, M.A.	Anne Mattina, Ph.D.	<i>Lecturer</i>
Michael L. Woodnick, M.S.	Joanne Morreale, Ph.D.	Thomas Shaker, M.A.
Alan J. Zaremba, Ph.D.	<i>Instructors</i>	
	David Branco, Ph.D.	
	Joseph Castiglione, M.S.	

Degrees Offered: Bachelor of Arts, Bachelor of Science

The Department of Speech Communication helps students develop a liberal arts, humanities-based understanding of the principles and practice of human communication. Courses are designed to increase student awareness of the nature and importance of effective communication in society. Students prepare themselves to be articulate and self-confident users of language.

■ Professional Preparation

The objective of the major is to provide students with a broad-based liberal arts education coupled with a preprofessional orientation to the field of communication. Speech communication students learn to

- speak articulately and persuasively in a variety of situations from interpersonal to mass communication;
- know the history and traditions of the field of communication;
- comprehend the philosophy, business, and technology of the communications industry;
- be effective advocates capable of defending their position on an issue;
- appreciate the aesthetics of discourse;
- grasp the role of communication in organizations;
- understand theories of human communication and be familiar with methods used by scholars of communication.

■ The Major

All students take core courses in areas such as interpersonal, public, and mass communication. Students then concentrate their study in one of three areas: rhetoric, advocacy, and public address; organizational and business communication; or mass communication. The department offers both theoretical and practical courses in all three areas.

Curriculum Enrichment The department offers students hands-on experiences in the communications field through cooperative education and internship experiences. Students also may work with individual professors in directed study. The department sponsors the NU Forensics Program through which students may engage in intercollegiate speaking.

■ The Minor

Students may minor in speech communication by taking a series of courses in the department developed with a faculty adviser. The following core courses are required of all minors: Introduction to Communication Theory, Business and Professional Speaking, Interpersonal Communication I, and Group Discussion.

Recommendations for further coursework have been specified for students majoring in management, marketing, elementary or secondary education, human or social services, political science, sociology, psychology, and journalism.

■ **Related Programs**

See Cinema Studies Minor, International Programs, Media Studies Minor, Teacher Preparation Option, Technical Communication, and Women’s Studies Minor in the Special Programs section, which begins on page 79.

Sciences and Mathematics

The natural and physical sciences analyze the nature and properties of energy and matter. Since most hypotheses are tested using numerical measurements, mathematics provides the theoretical underpinnings for much data analysis.

The sciences and mathematics focus on understanding the fundamental properties of a system or of principles that govern a system. These essentials of knowledge—whether operative in structure, organization, or process—provide the means by which we understand the world around us. The science and mathematics program comprises biology, chemistry, geology, mathematics, and physics.

Department of Biology

David C. Wharton, Ph.D., *Professor and Chairman*

Professors

Gwilym S. Jones, Ph.D.
Charles A. M. Meszoely, Ph.D.
M. Patricia Morse, Ph.D.
Fred A. Rosenberg, Ph.D.
Ernest Ruber, Ph.D.
Kenneth P. Sebens, Ph.D.
Phyllis R. Strauss, Ph.D.
Carol Warner, Ph.D.

Associate Professors

Joseph L. Ayers, Ph.D.
Kostia Bergman, Ph.D.

Donald P. Cheney, Ph.D.
H. William Detrich, Ph.D.
Charles H. Ellis, Jr., Ph.D.
Aileen F. Knowles, Ph.D.
Helen H. Lambert, Ph.D.
Richard L. Marsh, Ph.D.
Jacqueline M. Piret, Ph.D.
Susan Powers-Lee, Ph.D.
Daniel C. Scheirer, Ph.D.
Wendy A. Smith, Ph.D.

Assistant Professors

John W. Bodnar, Ph.D.
Frederick C. Davis, Ph.D.

Maryellen Polvino-Bodnar,
Ph.D.,
Jon D. Witman, Ph.D.

Professors Emeriti

Francis D. Crisley, Ph.D.
Charles Gainor, Ph.D.
Nathan W. Riser, Ph.D.

Adjunct Professor

Bruce B. Collette, Ph.D.

Adjunct Assistant Professor

Barbara L. Thorne, Ph.D.

Degrees Offered: Bachelor of Arts, Bachelor of Science in Biology

The biology major enables students to develop a basic understanding of the organization and the processes of life, from molecules and cells through organs and organ systems to populations, species, ecosystems, and evolution. The major offers the mathematical, chemical, and physical background to understand biology and to gain practical scientific skills associated with each of these areas. It allows students to begin to specialize in a subdiscipline of biology.

■ **Professional Preparation**

The biology major provides preparation for careers in the life sciences including medical, dental, and other health-related fields. Graduate study leading to a master’s or doctoral degree can open careers in upper-level teaching and/or research in areas such as zoology, botany, microbiology, physiology, ecology, marine biology, cell

biology, molecular biology, or biochemistry. Biology majors may also pursue postgraduate training in areas such as nutrition, public health, or medical technology.

Students entering the work force directly may find employment in federal, state, industrial, hospital, or university laboratories, or in industries involved in the manufacture and distribution of pharmaceuticals, biological products, food, or scientific equipment. Biologists also work in fisheries, forestry services, county and state agencies, museums, aquariums, research vessels, and marine stations.

Premedical or pre dental students are urged to consult with the preprofessional advisory committee early in their careers at Northeastern. *Successful completion of the required preprofessional courses by no means ensures admission to a professional school. Other factors are involved.*

■ The Major

The major consists of ten biology courses in addition to chemistry, physics, and mathematics. Six courses constitute the required “Biocore”: Principles of Biology I, II, and III; Environmental and Population Biology; Genetics and Developmental Biology; and Cell Physiology and Biochemistry. The other four biology courses may be chosen from upperclass biology electives that require some or all of the Biocore as prerequisites. The prescribed sequence can be followed if a student decides on the major in the freshman or sophomore year. Students who enter the major in the middler year may complete the major in the normal time by taking some electives concurrently with the Biocore courses. After completing the Biocore, students interested in independent research may arrange to undertake directed study. If eligible, they may be invited to undertake a more extensive honors program involving up to four quarters of research.

To graduate with a major in biology, a student must have a cumulative quality-point average (QPA) of 2.0 for all science and mathematics courses required for the major. The bachelor of arts and bachelor of science degrees require a modern language. The B.S. program is more extensive in its mathematics and science requirements and may offer better preparation for some areas of postgraduate study.

The department publishes *The Biology Undergraduate Advisory Book* that explains the required and recommended courses and the QPA standards for biology majors. The *Advisory Book* is available in the Office of Biology, 414 Mugar Hall. Students intending to major in biology should obtain a copy as early as possible after enrollment. Biology majors wishing to pursue a minor in another field should see their biology adviser as early in their program as possible.

■ The Minor

A minor in biology consists of any six biology courses for which the student has the prerequisites, plus two more courses. At least five of the eight courses must include laboratory.

Each student’s biology minor program must be approved by the biology minor’s adviser. A QPA of 2.0 must be achieved in courses used to satisfy the minor requirements. Courses taken on a pass/fail basis are not acceptable for minor credit.

■ Facilities

The Department of Biology has teaching laboratories for general biology, botany, anatomy, microbiology, microscopy, physiology, zoology, cell biology, molecular biology, and biochemistry. Equipment for fieldwork, museum specimens, models, and

charts are employed in laboratory instruction. Additional facilities include aquarium and animal rooms, stockrooms, preparation rooms, research areas, a vertebrate museum and herbarium, and a large suburban greenhouse and woodlot. The department has a close association with the University's Electron Microscopy Center and the Marine Science Center in Nahant (see page 188).

■ **Related Programs**

See Combined Program with Preprofessional Schools, East/West Marine Biology Program, International Programs, Marine Science Center Summer Program in Marine Biology, Marine Studies Minor, Massachusetts Bay Marine Studies Consortium, School for Field Studies Affiliation, and Teacher Preparation Option in the Special Programs section, which begins on page 79. See also information on the instrumentation for science minor in the Physics section, page 65.

Biochemistry

Degree Offered: Bachelor of Science in Biochemistry

Biochemistry includes nearly the entire spectrum of science—from physics and chemistry to biology and health care. The biochemistry major, sponsored jointly by the departments of biology and chemistry, provides a strong foundation in mathematics and the physical sciences.

Biochemists are working to decipher the information stored in human chromosomes. What they learn will be used to pinpoint the genetic causes of many diseases. The biochemistry major helps students prepare to work in research on such diseases as AIDS, cancer, and Alzheimer's; genetic engineering; and environmental clean-up.

■ **Professional Preparation**

A bachelor's degree in biochemistry allows students to enter the job market directly or to go on to graduate, medical, veterinary, dental, law, or business school. Students who wish to pursue a career directly upon graduation may find positions in biotechnology companies, drug companies, and government agencies where positions are available in laboratory research, clinical research, quality control, production, information systems, marketing, and technical sales. Students may pursue graduate study in biochemistry, molecular biology, cell biology, biophysics, genetics, toxicology, biotechnology, clinical chemistry, animal science, nutrition, plant pathology, and other biomedical sciences.

■ **The Major**

The biochemistry major allows students to take more courses in biology than would be normal for a chemistry major. Several biochemistry lecture courses and an intensive laboratory course are required. Students are encouraged to pursue a research problem in a faculty member's laboratory. This experience often leads to the publication of a paper in a biochemical journal.

The biochemistry major can be completed in four or five years. Cooperative education students work in biotechnology companies, hospital and university research laboratories, and government agencies in the Boston area. Opportunities also exist for cooperative work experiences with pharmaceutical and chemical companies outside Boston.

Department of Chemistry

Philip M. Warner, Ph.D., *Professor and Chairman*

Professors

Geoffrey Davies, Ph.D.
David A. Forsyth, Ph.D.
Bill C. Giessen, Dr.Sc.Nat.
Robert N. Hanson, Ph.D.*
Barry L. Karger, Ph.D.
Philip W. Le Quesne, Ph.D.,
D.Sci.
John L. Neumeyer, Ph.D.*
Mary J. Ondrechen, Ph.D.

William M. Reiff, Ph.D.

John L. Roebber, Ph.D.

Alfred Viola, Ph.D.

Paul Vouros, Ph.D.

Associate Professors

Thomas R. Gilbert, Ph.D.

Ira S. Krull, Ph.D.

Kay D. Onan, Ph.D.

Robert N. Wiener, Ph.D.

Lawrence D. Ziegler, Ph.D.

Assistant Professors

David J. Jebaratnam, Ph.D.

Rein U. Kirss, Ph.D.

Lutfur R. Khundkar, Ph.D.

Patricia A. Mabrouk, Ph.D.

Professor Emeritus

Robert F. Raffauf, Ph.D.*

Supervisor of Laboratories

Bernard J. Lemire, B.S.

Degrees Offered: Bachelor of Arts, Bachelor of Science

Chemistry is concerned with the structure and properties of substances and with the transformations they undergo. The educational objectives of the Department of Chemistry are to help students

- experience the intellectual stimulation of studying a physical science;
- grasp the basic principles and techniques of chemistry-related careers;
- prepare for graduate study in chemistry or related fields.

■ Professional Preparation

Challenging career opportunities exist in technical fields in which research, development, production, sales, market analysis, quality control, and management are involved. Chemistry major programs are based on a career-oriented concept and enable students to prepare for the study of medicine and dentistry and for advanced study in many fields of science.

Alumni have pursued careers such as chemical sales and management; clinical, medicinal, pharmaceutical, and forensic chemistry; geochemistry, mineralogy, and environmental chemistry; medicine; dentistry; industry; teaching and research.

■ The Major

The Department of Chemistry offers small classes and considerable interaction between faculty and students. English, calculus, physics, and basic chemistry are taken in the freshman year. The general chemistry courses may be exempted and other courses substituted. Upperclass students take courses in inorganic, organic, physical, and analytical chemistry. Additional advanced mathematics and science courses are required for the B.S. degree. German or Russian is recommended for students who plan to pursue graduate study in the sciences.

Qualified students are encouraged to undertake a research project under the supervision of a faculty member. An honors program is open to especially able students.

The department publishes *Chemistry at Northeastern*, which details the chemistry major requirements. Copies may be obtained in the main office of the Department of Chemistry, 102 Hurtig Hall, or from the Department of Undergraduate Admissions, 150 Richards Hall.

*Joint appointment with College of Pharmacy and Allied Health Professions

■ The Minor

The minor program offers courses in general, analytical, organic, and physical chemistry. For further information, contact the Department of Chemistry, 102 Hurtig Hall.

■ Facilities

The main facilities and faculty offices of the department are housed in Hurtig Hall, a modern, air-conditioned, five-story building. The James Flack Norris Room is a lounge for undergraduate chemistry majors. Additional research facilities are located in the Barnett Institute (see page 187). The department's major research equipment includes electron microscopes, mass spectrometers, lasers, X-ray diffractometers, nuclear magnetic-resonance spectrometers, Gouy and Faraday magnetic balances, Mössbauer spectrometers, and a variety of ultraviolet and infrared spectrometers.

■ Accreditation

Chemistry programs at Northeastern are approved by the American Chemical Society (A.C.S.). The B.S. degree meets the society's requirements for certification. Certified graduates are eligible for full membership in the A.C.S. after two years of experience.

■ Related Programs

See Combined Program with Preprofessional Schools, International Programs, Marine Studies Minor, School for Field Studies Affiliation, and Teacher Preparation Option in the Special Programs section, which begins on page 79. See also information on the instrumentation for science minor in the Physics section, page 65.

Department of Geology

Richard H. Bailey, Ph.D., *Associate Professor and Chairman*

Professors

Richard S. Naylor, Ph.D.
William A. Newman, Ph.D.

Associate Professors

Bernard L. Gordon, M.S.
Peter S. Rosen, Ph.D.
Martin E. Ross, Ph.D.

Assistant Professor

Malcolm D. Hill, Ph.D.

Degrees Offered: Bachelor of Arts, Bachelor of Science

The department offers degree programs in geology and environmental geology. Geology deals with the study of the physical features, composition, history, and processes of the earth. Today many geologists are working on developing and protecting water resources as well as seeking sources of mineral deposits and fossil fuels.

■ Professional Preparation

The geology program offers basic knowledge for working in almost any of the geological professions in both industry and government. Graduates work for geotechnical, consulting, or engineering firms, studying environmental problems or analyzing proposed construction sites. A number also work in the oil industry and for government agencies.

■ The Major

During their first two years, students should complete courses in chemistry, physics, biology, and mathematics along with physical and historical geology. Students complete the geology core by taking petrology and geomorphology.

In addition, students choose a minimum of 11 geology courses (3 required, 8 elective) for the bachelor of science degree or 7 courses (2 required, 5 elective) for the bachelor of arts. Although not required, stratigraphy, petrology, structural geology, and paleontology are usually among the electives chosen by undergraduates.

During the junior and senior years, students may select undergraduate research as an elective. Under faculty supervision, a problem is selected, defined, and researched.

■ **The Minor**

The Department of Geology offers minors in geology and in environmental geology. More information may be obtained by contacting the department chair.

■ **Field Trips**

A sound geological education must include first-hand experience in the field and direct observation of geological phenomena. Whenever appropriate, fieldwork on an individual or group basis will be part of courses.

■ **Related Programs**

See East/West Marine Biology Program, International Programs, Marine Studies Minor, School for Field Studies Affiliation, and Teacher Preparation Option in the Special Programs section, which begins on page 79. See also information on the instrumentation for science minor in the Physics section, page 65.

Department of Mathematics

Margaret B. Cozzens, Ph.D., *Professor and Chairperson*

Professors

Samuel J. Blank, Ph.D.
Bohumil Cenk, Sc.D.
Holland C. Filgo, Ph.D.
Terence Gaffney, Ph.D.
Alberto R. Galmarino, Ph.D.
Maurice E. Gilmore, Ph.D.
Mark Goresky, Ph.D.
Arshag B. Hajian, Ph.D.
Anthony Iarrobino, Ph.D.
Marc Levine, Ph.D.
Richard Porter, Ph.D.
Fred Roberts, Ph.D.
Jayant Shah, Ph.D.
Gabriel Stolzenberg, Ph.D.
Chuu-Lian Terng, Ph.D.
Dung Trangle, Ph.D.
Jack Warga, Ph.D.

Associate Professors

Mark Bridger, Ph.D.
Robert W. Case, Ph.D.
Stanley J. Eigen, Ph.D.
John Frampton, Ph.D.
Eugene Gover, Ph.D.
Samuel Gutmann, Ph.D.
Solomon M. Jekel, Ph.D.
Donald R. King, Ph.D.
Nishan Krikorian, Ph.D.
Venkatrama Lakshmibai,
Ph.D.
Robert C. McOwen, Ph.D.
Mark Ramras, Ph.D.
Egon Schulte, Ph.D.
Martin Schwarz, Ph.D.
Thomas O. Sherman, Ph.D.
Gordana G. Todorov, Ph.D.

Jerzy Weyman, Ph.D.
Andre Zelevinsky, Ph.D.

Assistant Professors

Florin Avram, Ph.D.
David Bernstein, Ph.D.
Mo-suk Chow, Ph.D.
Jennie Hansen, Ph.D.
Christopher King, Ph.D.
N. V. R. Mahadev, Ph.D.
Alex Martinskovsky, Ph.D.
Carla B. Oblas, M.S.
Samuel Stueckle, Ph.D.
Alexandru Suciu, Ph.D.

Lecturer

John Fox, M.S.

Degrees Offered: Bachelor of Arts, Bachelor of Science

Mathematics has become the foundation and a rich source of methods for most science and technology. Mathematicians possess the skill to analyze the crucial features of many diverse problems and apply rigorous techniques to solve them. The Department of Mathematics encourages students to develop and expand their abilities in this exact science.

■ Professional Preparation

Mathematical training may lead to opportunities in applied research (natural sciences, engineering, economics, management, computer science) as well as mathematical research, teaching, and/or industry.

■ The Major

The bachelor of arts program requires a minimum of 13 mathematics courses and a foreign language requirement. Because mathematics-related material is often written in French, German, Italian, or Russian, one of these languages is recommended. The bachelor of science requires a minimum of 16 mathematics courses but does not require the study of a foreign language.

By the end of the sophomore year, all students should complete a basic sequence of mathematics courses in calculus of one and several variables, differential equations, combinatorics, linear algebra, and numerical methods. Although a computer programming course is not required, students will be expected to learn the basic programming skills necessary for numerical solutions of complex problems.

A transition from the basic sequence to more advanced parts of the curriculum is provided by Analysis I–II and Advanced Linear Algebra I, which are prerequisites for many advanced courses in applied analysis, complex analysis, topology, and foundations. Students planning to take many mathematics courses should take Analysis I–II and Advanced Linear Algebra I in the middler year.

Students may wish to take a prerequisite for more advanced courses in algebra and/or one that includes linear, nonlinear, and dynamic programming. Courses in probability, statistics, and numerical analysis may also be taken after the basic mathematics sequence is completed.

■ The Minor

A minor in mathematics is available for students majoring in other fields. The minor consists of eight mathematics courses (four required, four electives) selected with the assistance of a departmental adviser.

■ Certification

On October 1, 1994, Massachusetts will institute a two-stage teacher certification process. Students planning to teach secondary school mathematics can complete the requirements for application to the first stage, Provisional Certification, while they are undergraduates. Such students must major in mathematics and take a specific minor in Education, which includes coursework and practice teaching.

■ Related Programs

See International Programs and the Linguistics Minor in the Special Programs section, which begins on page 79. See also information on the instrumentation for science minor in the Physics section on page 65, and computer science (many students do a double major in mathematics and computer science) on pages 121–124.

Department of Physics

Stephen Reucroft, Ph.D., *Professor and Chairman*

Professors

Ronald Aaron, Ph.D.
Petros N. Argyres, Ph.D.
Arun Bansil, Ph.D.
Paul M. Champion, Ph.D.
Alan H. Cromer, Ph.D.
William L. Faissler, Ph.D.
Marvin H. Friedman, Ph.D.
David A. Garelick, Ph.D.
Michael J. Glaubman, Ph.D.
Haim Goldberg, Ph.D.
Walter Hauser, Ph.D.

Jorge V. José, Ph.D.
Bertram J. Malenka, Ph.D.
Pran Nath, Ph.D.
Clive H. Perry, Ph.D.
Carl A. Shiffman, Ph.D.
Jeffrey B. Sokoloff, Ph.D.
Yogendra N. Srivastava, Ph.D.
Michael T. Vaughn, Ph.D.
Eberhard von Goeler, Ph.D.
Allan Widom, Ph.D.
Fa Yueh Wu, Ph.D.

Associate Professors

George O. Alverson, Ph. D.

Marie E. Machacek, Ph.D.
Robert S. Markiewicz, Ph.D.

Assistant Professors

Narendra K. Jaggi, Ph.D.
Alain S. Karma, Ph.D.
Jacqueline Krim, Ph.D.
Ian Leedom, Ph.D.
Russell LoBrutto, Ph.D.
Srinvas Sridhar, Ph.D.
Tomasz Taylor, Ph.D.

Professor Emeritus

Eugene J. Saletan, Ph.D.

Degrees Offered: Bachelor of Arts, Bachelor of Science

Physics is concerned with fundamental principles that govern natural phenomena, ranging in scale from collisions of subatomic particles through the behavior of solids and liquids to exploding stars and colliding galaxies.

The objectives of the physics undergraduate programs are to help students

- experience the intellectual stimulation of studying physics and astrophysics;
- experience the excitement of front-line research programs;
- understand the basic principles and techniques of physics-related careers;
- prepare for graduate study in physics or related fields.

■ Professional Preparation

In addition to work in industrial, government, and high-technology laboratories in areas of applied physics, students may find opportunities in such fields as biophysics, computer science, geophysics, medical and radiation physics, and engineering. Many students majoring in physics go on to pursue advanced degrees in physics and related fields.

The department offers four levels of undergraduate courses:

- descriptive courses for non-science majors with limited mathematical backgrounds;
- general survey courses for students in scientific and engineering fields;
- advanced courses intended mainly for physics majors;
- highly advanced courses intended mainly for prospective graduate students.

The co-op program allows students to alternate between classroom and off-campus work experiences in research and professional organizations throughout the United States. In a number of cases, physics majors work on co-op with a high-technology company and then return to school and work with a related aspect in one of the research programs of the department either for credit or as work-study.

■ The Major

The freshman-year program for all physics majors includes a three-quarter physics sequence common to all science and mathematics majors and a three-quarter calculus sequence. The remaining freshman courses are from the college core curriculum.

Beyond the survey courses in physics and mathematics, B.A. students are required to pass the two second-year intermediate physics courses, three upper-division lecture courses, three upper-division laboratory courses, as well as one upper-

division mathematics elective. The B.A. program is flexible and allows students to pursue other interests in depth.

Candidates for either of the B.S. physics degrees must complete the two intermediate physics courses, the second year of the calculus sequence, and a year of differential equations. In addition, the B.S. candidates must satisfy the appropriate college requirements as well as seven upper-division physics lecture courses, three upper-division physics laboratory courses, and five additional technical electives (from the sciences, mathematics, or engineering departments). The B.S. in physics program is most appropriate for those who wish to pursue graduate study in physics.

In addition to the intermediate-level courses described, candidates for the B.S. degree in applied physics must complete three upper-division physics lecture courses, five upper-division physics laboratory courses, three computer science courses, and four additional technical electives. The B.S. in applied physics program is most appropriate for students who expect to proceed directly to work after the B.S. degree or who expect to go to graduate school in related fields.

The upper-division lecture courses offered by the department include Astrophysics, Electromagnetic Theory, Mathematical Physics, Mechanics, Nuclear Physics, Quantum Mechanics, Solid State Physics, Thermodynamics, and Wave Motion and Optics. The upper-division laboratories include Wave Motion, two quarters of Electronics, a laboratory devoted to microcomputer programming and interfacing, and a special project laboratory in which the student designs and carries out a complete project involving either instrumentation or computational physics.

■ The Minors

The department offers the physics minor and the instrumentation for science minor. To fulfill the physics minor, students take three intermediate and/or advanced courses after completing introductory physics. Computer science and engineering students may have slightly different requirements for a physics minor.

The minor in instrumentation for science offers experience in the use of common laboratory instruments, the taking and analysis of data, and elementary skills in electronics. A major goal of the minor is to prepare the student to design and construct relatively small-scale, special-purpose measurement instrumentation. To fulfill the requirements of the minor a student must take four intermediate and/or advanced laboratory courses after completing introductory physics.

Further information on the minor programs may be obtained from the Department of Physics, 112 Dana Research Center.

■ Honors Program

Undergraduate students invited into the Honors Program may take graduate courses, reading courses, and special topics courses, by petition, in the various research fields of the department. Such work occasionally leads to presentation of papers at professional meetings and to publication in professional journals. For more information on the University Honors program, see pages 19–20.

■ Facilities

The Department of Physics is housed in the Dana Research Center, a modern, air-conditioned building with a library; research laboratories; department and student machine shops; electronics shop; conference and seminar rooms; and faculty, graduate, and undergraduate student offices. The department has a large number of Micro-VAX and PC computers dedicated to specific research programs; a PC cluster facility with graphics and high quality printing capabilities is available. All computers are connected to the University's central Computer Resource Center, which

includes a campus-wide Ethernet with BITNET national and international file-transfer and electronic mail capabilities.

Besides working at the research facilities on campus, faculty and graduate students pursue a variety of off-campus research projects: high-energy physics experiments at the Super Collider Laboratory, DeSoto, Texas, at CERN, Geneva, Switzerland, and at the Fermi National Accelerator Laboratory (Fermilab), Batavia, Illinois; high magnetic field experiments at the National Magnet Laboratory, Cambridge, Massachusetts; and inelastic neutron scattering experiments at the Brookhaven National Laboratory, New York, at the Oak Ridge National Laboratory, Oak Ridge, Tennessee, and at the Laue-Langevin Institute, Grenoble, France.

The department's faculty members are involved in a broad spectrum of experimental and theoretical programs in astrophysics, atomic and molecular physics, biophysics, elementary particle physics, and solid state and low temperature physics. A description of these programs may be obtained from the department chair.

■ **Related Programs**

See International Programs, Marine Studies Minor, and Teacher Preparation Option in the Special Programs section, which begins on page 79.

Social Sciences

The social sciences examine human groups and the consequences of individual and collective behaviors. These fields focus on people and base their study on objective analyses of systematically gathered data. The social science disciplines strive to comprehend the underlying regularities and relationships that characterize the social world. In attending to human experience, the social sciences bear a relationship to the humanities; in method, they are closer to the natural sciences.

The social sciences at Northeastern comprise African-American studies, economics, history, human services, linguistics, political science, psychology, and sociology/anthropology.

Department of African-American Studies

Ronald W. Bailey, Ph.D., <i>Professor and Chairman</i>		
<i>Professor</i>	William Lowe, M.A.	<i>Associated Faculty</i>
Patrick Manning, Ph.D.	<i>Music</i>	Donald M. Jacobs, Ph.D.
<i>History</i>	Joseph D. Warren, Ph.D.	<i>History</i>
	<i>Social Welfare</i>	Joyce Scott, Ed.D.
<i>Associate Professors</i>	<i>Assistant Professors</i>	<i>Literature</i>
Abdul Alkalimat, Ph.D.	Leonard Brown, Ph.D.	Herman S. Gray, Ph.D.
<i>Sociology</i>	<i>Music</i>	<i>Sociology</i>
Holly M. Carter, Ph.D.	Elizabeth Freydberg, Ph.D.	William F. Miles, Ph.D.
<i>Political Science</i>	<i>Theatre</i>	<i>Political Science</i>
Jordan Gebre-Medhin, Ph.D.	Kwamina Panford, Ph.D.	Oscar Brookins, Ph.D.
<i>Anthropology</i>	<i>Law, Policy and Society</i>	<i>Economics</i>
Maryemma Graham, Ph.D.	Clark White, Ph.D.	
<i>Literature</i>	<i>Sociology</i>	
Robert L. Hall, Ph.D.		
<i>History</i>		
<i>Degrees Offered:</i> Bachelor of Arts, Bachelor of Science		

African-American studies aims to expose all students to the experiences of African-American people and others of African descent. The curriculum reflects an interdisciplinary approach, based on the fields outlined by The National Council of Black Studies: historical, social-behavioral, and cultural studies. International studies, public policy, and the impact of science and technology—especially computers and media—are integral parts of the program.

Students focus on the acquisition of theoretical knowledge as well as the practical application of this knowledge to real-world problems and concerns. Students with training in African-American studies will have skills to meet the challenges posed by the diversity of racial, cultural, and ethnic groups, in the United States and abroad.

■ **Professional Preparation**

Majors will be prepared and expected to pursue all of the educational, occupational, and professional alternatives that students with rigorous training in any other liberal arts fields could follow. African-American studies graduates often attend professional school and teach at the secondary or college level. Others work in museums, libraries, research centers, social service agencies, business, public service, and social welfare and law enforcement agencies.

■ **The Major**

Students take 15 courses in the major: six African-American studies core courses, five courses in their field of concentration—historical studies, social-behavioral studies, or cultural studies—and a two-course sequence in each of two fields other than the area of concentration. One of these two-course sequences should be thematic: i.e., social change, public history, modern poetry, international relations, or media.

Students are encouraged to participate in activities such as the African-American Studies Club, the annual student delegation to the Model Organization of African Unity meeting at Howard University, trips to professional conferences, visits to local museums and historical sites, and ongoing research projects and programs.

■ **The Minor**

To qualify for a minor, a student must earn 28 quarter hours in the Department of African-American Studies. Required courses include Introduction to African-American Studies, Foundations of Black Culture, Black Community and Social Change, a historical survey course, a course on the Black Experience outside the United States, a senior seminar, and one elective.

■ **Related Programs**

See Human Services (page 71). See also Independent Major, International Programs, Teacher Preparation Option, and Women's Studies Minor in the Special Programs section, which begins on page 79.

Department of Economics

John Adams, *Professor and Chairman*

Professors

Conrad P. Caligaris, Ph.D.
Harold M. Goldstein, Ph.D.
Daryl A. Hellman, Ph.D.
Irwin L. Herrnstadt, Ph.D.
Sungwoo Kim, Ph.D.
Steven A. Morrison, Ph.D.
Gustav Schachter, Ph.D.
Andrew M. Sum, M.A.

Associate Professors

M. Shahid Alam, Ph.D.
Neil O. Alper, Ph.D.
Bruce R. Bolnick, Ph.D.
Oscar T. Brookins, Ph.D.
Kamran N. Dadkhah, Ph.D.
Alan W. Dyer, Ph.D.
Barbara M. Fraumeni, Ph.D.
Gregory Wassall, Ph.D.

Assistant Professors

Gopa Chowdhury-Bose, Ph.D.

Jonathan H. Haughton,
Ph.D.

Manfred W. Keil, Ph.D.
Katherine A. Kiel, Ph.D.
Loraine V. Lomax, Ph.D.
Fred K. Luk, Ph.D.
George A. Plesko, Ph.D.

Professor Emeritus

Morris A. Horowitz, Ph.D.

Degrees Offered: Bachelor of Arts, Bachelor of Science

Economics is the study of ways in which resources are deployed to satisfy the material wants of individuals and society. Economists analyze the factors that determine the success or failure of this process.

■ Professional Preparation

The economics program provides the opportunity for students to obtain a better understanding of how our economy and other economies function, to prepare for graduate study in economics, and to develop specialties that may qualify them to work as economists.

Macroeconomics, concerned with the overall economy, deals with such problems as inflation, unemployment, growth and instability, economic development, and government monetary and fiscal policies. Microeconomics is concerned with the economic behavior of individuals, households, firms, industries, and trade among countries. It seeks to assess the economic effects of market power and environmental damage and analyzes the economic aspects of natural resources, poverty, health, income distribution, trade unions, and government regulation. Several courses are devoted to the problems of women and minorities in the economy. Responding to changes in the modern world, the content of each course reflects international and multicultural perspectives.

Graduates may be employed in industrial relations, planning and forecasting, determining plant locations, and making financial studies. They may become expert in analyzing consumer demand and developing and marketing new products. They may conduct research, teach, or provide specialized consulting services. Federal, state, and local governments, major corporations, and financial institutions are important sources of jobs for economists.

A baccalaureate economics degree or graduation with a number of advanced economics courses offers students an opportunity to prepare for graduate programs in economics as well as for entry into schools of law and business.

■ The Major

A student expecting to major in this field should take the problem-oriented courses Principles of Macroeconomics and Principles of Microeconomics in the freshman or sophomore year to discover the range of insights economics can offer in analyzing and solving a variety of problems. Upperclass courses apply theory to a specific area of the field.

Other courses for the major include two quarters each of fundamentals of mathe-

matics, economic statistics, and economic theory. In addition, the department offers electives in many areas of economics, honors courses, and reading courses.

The courses listed above are required for the bachelor of arts and bachelor of science degrees. The B.A. follows the liberal arts tradition in its core curriculum and language requirements—the Department of Economics requires social science courses as well, plus six economics electives and a course in the mastery of economic thought. The B.S. is a professional degree. In addition to its core curriculum requirements and social science electives, it requires ten economics electives and one course in econometrics or research methods.

The economics elective courses offer training in money and banking, public finance, international trade, growth and development, industrial organization, comparative economic systems, economics of energy, environmental economics, economics of crime, urban problems, labor economics, human resources, economics of transportation, poverty and discrimination, and medical economics. Tool courses such as statistics, mathematical economics, and econometrics are also available. Other electives and reading courses permit students to study particular areas.

■ **The Minor**

The department offers a minor consisting of four required courses and four electives, which are selected in consultation with a faculty adviser. Any course taken outside the Department of Economics to satisfy these minor elective requirements must be approved by a faculty adviser in the department.

■ **Related Programs**

See Business German, French for Business and Economics Students, International Programs, Russian Studies Minor, and Teacher Preparation Option in the Special Programs section, which begins on page 79.

Department of History

Raymond H. Robinson, Ph.D., *Professor and Chairman*

Professors

Philip N. Backstrom, Ph.D.
Ballard C. Campbell, Ph.D.
William M. Fowler, Jr., Ph.D.
Harvey Green, Ph.D.
Donald M. Jacobs, Ph.D.

Patrick Manning, Ph.D.
Anthony N. Penna, D.A.
John D. Post, Ph.D.
Associate Professors
Charmarie J. Blaisdell, Ph.D.
Laura L. Frader, Ph.D.

Christina Gilmartin, Ph.D.
Clay McShane, Ph.D.
Assistant Professors
Ruth-Ann M. Harris, Ph.D.
Gerald H. Herman, M.A.

Degrees Offered: Bachelor of Arts, Bachelor of Science

History’s concern with the diverse and complex past of humanity provides an excellent opportunity for the development of greater understanding and appreciation of today’s cultures and civilizations.

■ **Professional Preparation**

Traditionally, history as a major has appealed to students desiring a broad base for careers in business, law, journalism, and government.

Other history majors want to work more directly in history. Those who want to teach in public schools may elect education courses that may lead to state certification (see page 93). Those desiring jobs in private secondary schools need not be certified by state authorities. Teaching positions in colleges and universities require master’s degrees and, increasingly, doctorates. Undergraduates who major in history facilitate their entrance to graduate programs in the field.

Some professional historians teach and write; others work in public archives, private historical societies, museums, and restoration projects. These careers serve not only other professional historians but a larger public as well.

■ The Major

Since the B.A. requires a foreign language, it appeals to prospective candidates for graduate school, where reading knowledge of foreign languages is often necessary; the B.S. is designed for students desiring a social science orientation and greater specialization in history.

Candidates for both degrees are required to take Western Civilization I and II or World Civilization I and II, American History I and II, and The Historian's Craft, which focuses on methods, problems, and philosophies of historians. A later course, Approaches to History, requires students to undertake a major historical project. Elective courses cover the political, economic, social, and cultural history of humanity in diverse times and places.

The history requirements are divided into groups: Group A (ancient, medieval, and early modern Europe); Group B (modern Europe); Group C (British North American colonies and the United States); and Group D (other areas or regions). A minimum of two courses (eight quarter hours) must be elected from each group.

Students are urged to avoid overspecialization at the undergraduate level. Although there are no maximum limits on the amount of history that may be taken, the department advises broad course selection as the best policy. To ensure a broad program of study, the College of Arts and Sciences requires that students choose courses offered by departments outside the area of the major.

Students who qualify are urged to consider the honors program in history. Those accepted write honors theses under the direction of members of the department. Students ordinarily register for honors courses in their last three quarters of enrollment, except for the summer quarter, when honors courses are not usually offered.

■ The Minor

The history minor requires eight courses, two of which must be chosen from the introductory World Civilization, Western Civilization, or American History courses. The remaining six may be selected from the list of history offerings. For more information or advice, students should contact the chairman of the History Department.

■ Related Programs

See Asian Studies Minor, International Programs, Irish Studies Program, Russian Studies Minor, Teacher Preparation Option, and Women's Studies Minor in the Special Programs section, which begins on page 79. See also *New England Quarterly* in the section on journals, page 87.

Human Services

John D. Herzog, Ph.D., <i>Department of Education, Co-Director and Professor</i> Wilfred E. Holton, Ph.D., <i>Department of Sociology/Anthropology, Co-Director and Associate Professor</i>		
<i>Advisory Committee</i> Diana S. Graham, Ph.D. <i>Health, Sport, and Leisure Studies</i> John D. Herzog, Ph.D. <i>Education</i> Wilfred E. Holton, Ph.D. Maureen E. Kelleher, Ph.D. <i>Sociology/Anthropology</i> Louise La Fontaine, Ed.D.	Lawrence Litwack, Ed.D. <i>Counseling Psychology, Rehabilitation, and Special Education</i> Richard A. Loverd, Ph.D. <i>Political Science</i> Gordana Rabrenovic, Ph.D. <i>Sociology/Anthropology</i> David A. Rochefort, Ph.D. <i>Political Science</i>	Barbara A. Schram, Ed.D. <i>Education</i> Harold S. Zamansky, Ph.D. <i>Psychology</i> <i>Fieldwork Supervisor</i> Natalie H. Riffin, M.Ed., O.T.R.
<i>Degrees Offered:</i> Bachelor of Arts (Arts and Sciences), Bachelor of Science in Education (Boston-Bouvé)		

Human services is an interdisciplinary major involving the Boston-Bouvé College of Human Development Professions and the College of Arts and Sciences. It may lead to many meaningful careers in the helping professions or to numerous graduate specializations.

■ **Professional Preparation**

Students who major in human services prepare for jobs in both public and private agencies, exploring such areas as case work in social service and welfare agencies; therapeutic treatment programs in mental health settings; serving deaf clients through the use of American Sign Language; counseling in health centers; rehabilitation counseling; assisting individuals in sheltered workshops; parole counseling; court liaison work in programs for delinquent youth; staff work in halfway houses, penal institutions, and drug treatment centers; supportive counseling for the mentally retarded; community organizing; services for the aging; administration in human services agencies; and research and evaluation of social programs.

■ **The Major**

The Human Services Program offers an extensive advisory system to help students make the best use of course opportunities and to guide them in the choice of major specializations and in career planning.

■ **Graduation Requirements**

The overall requirements for each participating college differ in certain respects. Refer to pages 45–46 for college requirements in the College of Arts and Sciences, and to pages 91–92 for college requirements in Boston-Bouvé College of Human Development Professions. Students in Boston-Bouvé College complete a five-year cooperative education program. The basic aspects of the program are as follows:

Prerequisite courses Prescribed courses in counseling, sociology, psychology, government, economics, and human services, for a total of six courses.

Core courses Nine courses in areas including counseling, statistics, research methods, group process, organizations, personality, intervention strategies, and a senior seminar.

Social and community issues Three courses from a list of recommended options in the areas of African-American studies, special education, poverty, or social problems.

Specializations A five-course specialization developed in conjunction with an adviser, in a subfield of human services of special interest to the student.

Typically, these specializations are in one of three areas: administrative, community, or clinical. Structured specializations have been developed in deaf studies, aging, administration, business, speech and hearing therapy, and other areas. Specific course choices are designed to complement the individual's interests and goals.

Fieldwork Two mandatory fieldwork placements during the last two years of their program. Students must apply for fieldwork assignments early in the quarter before the fieldwork will be done. Each placement consists of 150 hours on site. The type of placement varies according to the student's interest. In the past, students have found placements in community programs, nursing homes, vocational workshops, state and federal agencies, and recreational facilities—all under supervision by University staff.

Cooperative education experiences provide additional opportunities to put classroom knowledge and personal talents to work.

■ **Related Activities**

The Human Services Student Organization combines social and career-related activities, which in the past have included open houses, bake sales, clothing drives, meals for the homeless, social activities, day-long conferences, and weekend retreats.

Students and faculty publish the *Human Services Newsletter* quarterly. They also co-lead the Fenway Project, a campus office that recruits, places, and supports student volunteers in social, educational, and recreational agencies in Northeastern's immediate neighborhood. In recent years, project volunteers have worked with senior citizens, school-age children from a nearby housing project, patients and staff from a local health clinic, and many other groups. The year culminates in a community fair, the Fenfest, attended by students and permanent neighborhood residents. The Fenway Project began in 1973 through the auspices of Boston-Bouv  College and has been administered by the Human Services Program since 1986.

■ **Related Programs**

See American Sign Language Programs, Business Minor, Elementary Spanish Course for Criminal Justice and Human Services Majors, International Programs, Irish Studies Program, Linguistics Minor, and Women's Studies Minor in the Special Programs section, which begins on page 79.

Linguistics

Janet H. Randall, Ph.D., *Associate Professor and Coordinator*

Professors

Irene R. Fairley, Ph.D.

English

Harlan Lane, Ph.D.,

Doc.  s Lettres

Psychology

Joanne L. Miller, Ph.D.

Psychology

Associate Professors

John N. Frampton, Ph.D.

Mathematics

Michael R. Lipton, Ph.D.

Philosophy and Religion

Assistant Professors

Debra Arteaga, Ph.D.

Modern Languages

Anthony P. Esposito, M.A.,

Modern Languages

Nancy N. Soja, Ph.D.

Psychology

Shari Speer, Ph.D.

Psychology

Lynn Stephen, Ph.D.

Anthropology

Degrees Offered: Bachelor of Arts, Bachelor of Science

Linguistics is the science of language and focuses on such issues as how children learn to speak, how we understand and produce language, how language barriers keep people apart and language ties bring them together, how language is structured and represented in the mind, why some people are better at acquiring a second language than others, and how sign languages differ from spoken languages.

■ Professional Preparation

A major in linguistics may be a first step in becoming a linguist, an expert on child language, an interpreter, or an expert in the production and comprehension of language by computers. Specializing in linguistics allows students to gain insight into language itself—a fundamental component of the human cognitive system.

■ The Major

Linguistics is an interdepartmental major. Five departments (English, Modern Languages, Philosophy and Religion, Psychology, and Sociology/Anthropology) collaborate to offer a comprehensive program. The major reflects the current research of linguists, sociologists, psychologists, language educators, and teachers of second languages.

The major offers a systematic introduction to modern linguistics and is designed to meet the needs of students interested in

- general linguistics (phonetics and phonology, semantics, syntax, bilingualism, historical linguistics, philosophy of language, language and culture, American Sign Language);
- experimental linguistics (language and cognition, child language, neurolinguistics, psycholinguistics);
- language-related work (language teaching, language testing, language teaching materials, interpreting, literary analysis).

Bachelor of arts and bachelor of science degree requirements are similar. The second language requirement can be met with American Sign Language for the B.S. degree but not for the B.A. degree.

Besides the general college requirements, the major includes six basic courses from the main areas of linguistics: general linguistics, psycholinguistics, sociolinguistics, and symbolic logic. Students also take five additional courses in an area of choice. These courses include, among others, Child Language, Philosophy of Language, Neurolinguistics, History of the English Language, Nonverbal Communication, Animal Communication, Introduction to Semantics, and Applied Linguistics. All students also take

- an introductory laboratory course in language research;
- two advanced seminars in cognition, linguistics, psycholinguistics, or stylistics;
- a practicum in the form of fieldwork, interpreting, language teaching, directed study, or other experience.

Students must demonstrate second-language proficiency through the level of Intermediate II plus two advanced courses. This requirement may be met either by taking courses or by the appropriate placement procedures.

Combined with other courses, the program is suitable for students interested in teaching American Sign Language. A concentration in the applied linguistics of sign language enables students to acquire the skills necessary to become professional teachers and helps them prepare for sign language instructor certification.

■ The Minor

The linguistics minor complements the study of any other language-related area.

Specialized concentrations in linguistics include psycholinguistics, stylistics, language and culture, second-language teaching and applied linguistics, theoretical linguistics, and American Sign Language linguistics. Research opportunities exist through directed work-study.

■ **Facilities**

Students in a directed-study or laboratory course may use the Department of Psychology’s language laboratories, which contain audio and video recording facilities and computers for stimulus preparation, data gathering, and statistical analysis. Undergraduates work with graduate students, research assistants, and faculty on projects related to the perception and production of spoken and sign languages.

■ **Related Programs**

See American Sign Language Programs and International Programs in the Special Programs section, which begins on page 79. See also The Minor in the English section, page 52; The Minor in the Psychology section, page 77; and the Computer Science section, page 123.

Special Note A brochure describing the linguistics major and minor and offering additional information can be obtained from any of the Linguistics faculty members.

Department of Political Science

Suzanne P. Ogden, Ph.D., *Professor and Chairman*

<i>Professors</i>	Eileen L. McDonagh, Ph.D.	Richard A. Loverd, Ph.D.
Robert L. Cord, Ph.D.	William F. S. Miles, Ph.D.	John H. Portz, Ph.D.
Robert E. Gilbert, Ph.D.	David A. Rochefort, Ph.D.	John F. L. Ross, Ph.D.
David E. Schmitt, Ph.D.		Denis J. Sullivan, Ph.D.
<i>Associate Professors</i>	<i>Assistant Professors</i>	Michael C. Tolley, Ph.D.
Christopher J. Bosso, Ph.D.	Leslie E. Armijo, Ph.D.	Bruce A. Wallin, Ph.D.
L. Gerald Bursey, Ph.D.	David A. Dickson, Ph.D.	
Minton F. Goldman, Ph.D.	Duane L. Grimes, M.A.	
	William D. Kay, Ph.D.	

Degrees Offered: Bachelor of Arts and Bachelor of Science in Political Science;
Bachelor of Science with a concentration in Public Administration;
Bachelor of Arts and Bachelor of Science with a concentration in Law and Legal Issues

Political science is the study of political institutions, the social and economic forces that shape them, the cultural contexts within which they operate, and human behavior in political matters.

The goals of the department are to help students

- obtain a liberal arts education;
- develop an awareness of political forces in the environment;
- become more aware of their role as citizens in a democratic society;
- acquire a solid academic foundation for careers in political science, law, public administration, or other fields.

■ **Professional Preparation**

Studies in political science can help students prepare for government service; law; teaching; careers in politics, public affairs, public management, journalism, international affairs, or international business.

For students who wish to pursue professional studies at the graduate level, concentration in political science, public administration, and/or law and legal issues may lead to many opportunities. The student’s success will depend on such factors

as academic record, experience, and personal initiative. Career opportunities exist in public management at the federal, state, and local levels of government, while positions in research are available in government, university, and independent research bureaus. Law and teaching also offer career possibilities, as do specialized agencies in international bodies, such as the United Nations. Individuals with specialized training in political science can compete for positions in the public-service programming of educational and commercial television, in journalism, in legislative and lobbying work, in the public relations activities of private associations, and in profit and nonprofit corporations.

■ The Major

The department offers a wide range of courses, from international relations and comparative politics to American politics, constitutional law, political philosophy, and public administration. The degree programs require several introductory political science courses, 24 to 28 quarter hours of electives in political science and six electives (24 quarter hours) in the social sciences. The social science electives must include one course each in three of the following: African-American studies, anthropology, economics, history, psychology, or sociology. The B.S. student is required to take two research methods courses in lieu of a foreign language requirement. The remaining three electives may be selected from any of the social science areas.

Law and Legal Issues Concentration A concentration in law and legal issues requires the completion of Introduction to Politics, American Government, Public Administration, and Political Theory as well as six electives relevant to law and legal issues, such as Constitutional Law, Civil Liberties, Law and Personal Morality, and International Law. Students in this concentration must take a limited number of additional political science courses as well as six electives in the social sciences. For students in the B.S. program, two research methods courses are required.

Public Administration Concentration The B.S. program with a concentration in public administration requires the completion of 40 hours of such courses as Introduction to Politics, American Government, Public Administration, Policy Analysis, Public Personnel Administration, Public Budgeting, Organizational Theory, and other courses relevant to the field. Students must also complete at least 16 quarter hours of public administration electives.

In addition, they must complete 24 quarter hours of electives in the social sciences, at least eight of which should be in economics. Interested students may undertake a directed-study project based on an internship experience in a government agency.

■ The Minors

A minor in political science entails successfully completing seven political science courses, at least two of which must be from among the following: Introduction to Politics, Introduction to American Government, Introduction to International Relations, Introduction to Foreign Governments, or Public Administration.

A minor in international politics requires successful completion of seven courses in international and/or comparative politics, including Introduction to International Relations and Introduction to Foreign Governments and Societies.

■ Honors

Qualified students may participate in honors courses and honors sections of regular courses. The College of Arts and Sciences provides additional components for honors students, including an enriched curriculum and an extensive system of advisers and special activities. See page 19.

■ **Related Programs**

See International Programs, Asian Studies Minor, Russian Studies Minor, Teacher Preparation Option, and Women's Studies Minor in the Special Programs section, which begins on page 79. See also Center for Asian Studies, page 187.

Department of Psychology

Leon J. Kamin, Ph.D., *Professor and Chairman*

Professors

Stephen G. Harkins, Ph.D.
Harlan L. Lane, Ph.D.,
Doc. ès Lettres
Joanne Miller, Ph.D.
Bertram Scharf, Ph.D.
Alexander A. Skavenski, Ph.D.
Harold S. Zamansky, Ph.D.

Associate Professors

Edward A. Arees, Ph.D.
Martin L. Block, Ph.D.
Roger Brightbill, Ph.D.
Perrin S. Cohen, Ph.D.
Judith A. Hall, Ph.D.
Charles Karis, Ph.D.
Anne E. Kelley, Ph.D.
Harry Mackay, Ph.D.
Adam Reeves, Ph.D.
James R. Stellar, Ph.D.

Assistant Professors

David Bryant, Ph.D.
Jane A. Bybee, Ph.D.
Rhea Eskew, Ph.D.
Anne Kelley, Ph.D.
Julie K. Norem, Ph.D.
Nancy N. Soja, Ph.D.
Shari Speer, Ph.D.

Degrees Offered: Bachelor of Arts, Bachelor of Science

Psychology explores the behavior of animals and people, and the way people think. Psychology is an interdisciplinary science that includes methods and knowledge derived from the other natural and social sciences.

The psychology curriculum explores such topics as the function of the brain in determining behavior; how we see, hear, and learn; what is abnormal personality; how people develop emotionally and cognitively; and how individuals work in groups. The curriculum offers opportunities for laboratory practice and experimentation, individual research projects, and small-group seminars to encourage critical evaluation of psychology's accomplishments and its future.

■ **Professional Preparation**

The curriculum enables students to develop a solid scientific background in psychology and prepares students for careers in teaching, business, public service, and research. The curriculum also provides the basics for entrance to graduate programs in experimental, clinical, and educational psychology; law; and medicine.

■ **The Major**

Degrees offered are the bachelor of arts (B.A.) and the bachelor of science (B.S.). The B.A. is intended for students who wish to pursue a broad liberal arts education that explores the humanities, social sciences, and, to a lesser extent, natural sciences. The B.S. degree is more specialized and is usually recommended for students who have a strong scientific interest in psychology and the natural sciences. A B.S. degree is recommended for students planning later graduate study in psychology, or for combining psychology with another interest, such as premedical training.

The B.A. and B.S. degrees differ in the pattern of required courses within the Psychology Department and the college core curriculum. The options are explained to all new students by their academic advisers at the beginning of their academic careers. The department encourages all students interested in psychology to call or visit the department for more information.

■ **The Minor**

Each student is required to take ten psychology courses, including the introductory psychology and statistics sequence, intermediate specialty courses, and at least one laboratory course. Students should meet with the undergraduate secretary in the department for more details.

■ **Facilities**

The department's resources for research include behavior laboratories for research with humans and animals; neuroanatomical, neuropharmacological, and histological laboratories; specialized enclosures and equipment for presenting visual and auditory stimuli and for measuring responses of the eye and the ear, including online computers; audio and video recording facilities and a computer for control of stimulus and response variables; and tachistoscopes, videotape equipment, and computerized subject rooms.

■ **Related Programs**

See American Sign Language Programs, Combined Program with Professional Schools, International Programs, Linguistics Minor, Teacher Preparation Option, and Women's Studies Minor in the Special Programs section, which begins on page 79.

Additional information regarding degree requirements, laboratory research opportunities, special academic programs, and career opportunities for psychology majors is available through the Department of Psychology at 125 Nightingale Hall, or by telephoning 617-437-4702.

Department of Sociology and Anthropology

Michael E. Brown, *Professor and Chairman*

<i>Professors</i>	Winifred Breines, Ph.D.	<i>Assistant Professors</i>
Morris Freilich, Ph.D.	Christine Gailey, Ph.D.	Michael Blim, Ph.D.
Debra R. Kaufman, Ph.D.	M. Patricia Golden, Ph.D.	Daniel R. Faber, Ph.D.
Elliott A. Krause, Ph.D.	Herman S. Gray, Ph.D.	Luis M. Falcon, Ph.D.
Jack Levin, Ph.D.	Wilfred E. Holton, Ph.D.	Maureen Kelleher, Ph.D.
Ronald J. McAllister, Ph.D.	Anthony T. Jones, Ph.D.	Gordana Rabrenovic, Ph.D.
Earl Rubington, Ph.D.	Alan M. Klein, Ph.D.	Lynn Stephen, Ph.D.
<i>Associate Professors</i>	Thomas H. Koenig, Ph.D.	<i>Professor Emeritus</i>
Arnold Arluke, Ph.D.	Carol A. Owen, Ph.D.	Morton Rubin, Ph.D.
Richard Bourne, Ph.D.	Judith Perrolle, Ph.D.	
	Thomas M. Shapiro, Ph.D.	

Degrees Offered: Bachelor of Arts, Bachelor of Science

Sociology and anthropology provide a critical perspective for the study of the social arrangements in which people live. Various theories and research methods are presented for understanding how societies function and the conditions under which they change. The critical perspective emphasizes the aspects of society that account for the regulation of human action and those that account for resistance and opposition. The major topics offered are gender, race and ethnicity, cities, sources of social conflict, law and crime, intercultural relations, technology and the environment, and the comparative analysis of societies.

■ **Professional Preparation**

A major in sociology or anthropology offers background preparation and preprofessional training for careers in public or private service and research. Students may wish to pursue graduate study in sociology, anthropology, or social

psychology. Sociology and anthropology provide a good basis in theory and methodology for the pursuit of graduate training for academic research or professional careers in teaching, social work, or public administration.

Sociology and anthropology courses can help provide a useful background for students in premedical, prelegal, paramedical, or other preprofessional programs. Cooperative education experiences vary from mental hospitals and social agencies to university, government, and other research and policy-making settings.

■ The Majors

Students may major in sociology or anthropology or both. Those who wish to study both design their own programs with the help of an adviser.

The requirements for sociology and anthropology degrees are listed here. Students with specific goals may take more departmental electives than are required. B.A. students may consider the requirements for B.S. students and consult their advisers for assistance in planning programs with specialized goals.

Students working toward a B.S. in anthropology or sociology must fulfill all the major requirements for the B.A. degree and must take additional coursework, as outlined here. Specializations are interdisciplinary and involve intensive study.

Anthropology Students seeking a B.A. in anthropology must take at least 40 quarter hours in anthropology and 8 in sociology. The exact distribution can be arranged. Minimum requirements are as follows:

- Preparatory: Peoples and Cultures and Introduction to Sociology. (Students with equivalent background who intend to major in anthropology may be exempted. Students should consult a departmental adviser.)
- Core requirements: at least three from among Language and Culture; Individual and Culture; Human Origins; Myth and Religion; Sex, Sex Roles, and Family; and Archaeology.
- Electives: at least six electives in anthropology and at least one elective in sociology. Qualified students are encouraged to take relevant graduate courses with the consent of the instructor. Students majoring in anthropology should consult their advisers since courses elsewhere in the University may round out a special interest.
- Nondepartmental requirements: six courses from among African-American studies, economics, history, political science, and psychology.

Students pursuing a B.S. in anthropology take the same basic core of courses and select a specialization consisting of at least five courses. Students must confer with an adviser who will help develop such a program, place it on record, and supervise it. Interdepartmental and interdisciplinary specializations can be arranged in such areas as linguistics, Native American studies, biological anthropology, psychological anthropology, or area studies focusing on Latin America, Africa, Asia, or the Middle East.

Sociology Bachelor of Arts students in sociology must take 44 quarter hours in sociology and 8 in anthropology, and must meet the following requirements:

- Preparatory: Peoples and Cultures and Introduction to Sociology. (Students with equivalent background who intend to major in sociology may be exempted. Students must check with a departmental adviser.)
- Core requirements: Statistical Analysis; Research Methods I; Research Methods II; Classical Social Thought; Current Social Thought; Class, Power, and Social Change.

- Minimum elective requirements: two intermediate courses (excluding Introduction to Sociology); two advanced courses; and one intermediate or advanced anthropology course. With the adviser's consent, qualified students are encouraged to take graduate and directed-study courses and/or the Senior Majors Seminar.
- Nondepartmental requirements: six courses from the following social sciences: African-American studies, economics, history, political science, and psychology.

Bachelor of Science degree students in sociology take the same basic core of courses as B.A. students and select a specialization consisting of at least six courses. Students must confer with an adviser to develop such a program. Specializations can be arranged focusing on social welfare, health services, political studies, urban studies, education and society, ethnic studies, and organizational studies.

■ The Minors

Anthropology The minor program consists of the following:

- Peoples and Cultures;
- Language and Culture, Individual and Culture, and Sex, Sex Roles, and Family;
- any two-course specialization arranged between the student and the adviser.

Sociology The minor program consists of the following:

- Introduction to Sociology;
- two courses from among Research Methods I, Research Methods II, Classical Social Thought, and Current Social Thought;
- any three-course specialization in sociology arranged between the student and the adviser;
- one additional sociology course.

Sometimes a course from another department may be substituted for one of the requirements.

■ Related Programs

See International Programs, Russian Studies Minor, School for Field Studies, Teacher Preparation Option, and Women's Studies Minor in the Special Programs section.

Special Programs in the College of Arts and Sciences

The College of Arts and Sciences offers a wide variety of special programs. Field-study programs, international work-study opportunities, interdisciplinary majors and minors, and involvement with professionals are available to students who meet the program eligibility requirements. Detailed information about these programs is available from involved departments and the Office of the Dean.

Availability of all special programs is contingent on minimum enrollment requirements and, when an outside institution is involved, continued affiliation of that institution with the University. Overseas study programs are open to qualified middlers, juniors, and seniors with a cumulative quality-point average of 3.0 or higher.

■ International Programs

East/West Marine Biology See page 81.

International Cooperative Education Extending its Cooperative Plan of Education to the international scene, Northeastern offers qualified upperclass students the opportunity for placement abroad. This program operates in cooperation with overseas institutions and sponsoring agencies. Students whose academic, linguistic, and professional experience qualifies them for overseas positions may work in Great Britain, The Netherlands, Sweden, Ireland, Canada, and the French- and German-speaking countries of Europe. The program helps to meet a need for professionals with the international expertise and language proficiency to help companies expand overseas markets. Detailed information about the program may be obtained from the Department of Modern Languages, 360 Holmes Hall, or the Office of International Cooperative Education, 502 Stearns Center.

Ireland: North and South Through collaborative arrangements with the Institute of Public Administration in Dublin, Ireland, and the Queen's University of Belfast, Northern Ireland, qualified Northeastern students attend classes during the fall in Dublin, where they also intern with members of the lower house of the Irish parliament (the Dail). At the completion of the quarter, students move to Northern Ireland, where they attend classes at the Queen's University of Belfast. A total of 32 credits may be earned for successful completion of this program.

Irish Studies Program This program promotes cultural programs on Ireland and Irish America, and cooperative exchanges of Irish and American students for work and study. The Distinguished Speakers Series enables University faculty and staff to develop mutually beneficial relationships with Irish counterparts in all disciplines.

The program includes a research project on a database of characteristics of Irish immigrants in North America. When completed, the project will provide a rich source of data on the origins, arrival, and migration patterns of the Irish in America. Data are drawn from a missing persons column that ran in the *Boston Pilot* from 1831 through 1916. Volume One, which consists of 4,788 entries (1831–1850), was published by the New England Historic Genealogical Society in 1989. The second volume was published in the spring of 1991.

Through International Co-op, students are placed in various businesses and government agencies in the Republic of Ireland and in Northern Ireland. The Working Papers in Irish Studies Series provides an opportunity to disseminate manuscripts of current interest. Cultural efforts include a film series, development of a library collection, and art exhibitions; as well as student activities in the Irish Student Club. Plans to develop an interdisciplinary minor are under way. Dr. Ruth-Ann Harris, Department of History, is the director of the Irish Studies Program. For more information, telephone Dr. Harris at 617-437-2907.

Northeastern University—Moscow State University Exchange This six-month program began with an exchange of ten students. The first month is devoted to an intensive language course (prior study of Russian required). Students take courses in journalism and participate in an internship in a Soviet media organization. Students earn 32 credits upon successful completion of the program.

School for Field Studies The College of Arts and Sciences is affiliated with the School for Field Studies (SFS), a nonprofit educational organization that offers semester-long one-month field study expeditions throughout the world. Offered yearly are semester programs on wildlife management in Athi Plains, Kenya; on coral reef ecology in St. John, U.S. Virgin Islands; and on the rain forest biogeography of North Queensland,

Australia; and others. Programs combine applied academics with training in field research methods and teamwork—an exciting hands-on approach to science. Credit is granted for the coursework. Students of all levels and disciplines are eligible, but participation of Northeastern University students is limited proportionate to the total number of outside participants in the SFS program. Additional information may be obtained from the Office of the Dean of the College of Arts and Sciences.

Year at Oxford Special academic counseling is available to qualified students who wish to spend a year at St. Hugh's College, St. Hilda's College, or St. Edmund Hall.

■ Foreign Languages

Business German Students may use this course as a prerequisite to conversational German courses in preparation for a business-oriented co-op in Germany (see International Cooperative Education, page 80).

This course, taught in English, is designed for students of business and economics seeking competence in the reading and understanding of texts produced by the German business community and trade media. Course goals are to help students

- develop a working knowledge of the grammar and terminology used in business writings;
- develop effective comprehension procedures for efficient reading;
- understand Germany, its industrial geography, trade relations with the United States, and role in international commerce.

Readings from English-language trade publications ensure a steady influx of outside information and serve as the basis for weekly summary assignments designed to upgrade students' writing skills.

Additional information may be obtained from Professor Ross Hall in the Department of Modern Languages, 360 Holmes Hall, 617-437-2234.

Elementary Spanish for Criminal Justice or Human Services Majors This course is intended for students who will need to use Spanish in police work and in social service settings. The grammar taught is the same as that in other elementary Spanish courses. The vocabulary is adapted to particular needs and interests of the students. Role-playing is used extensively, and students practice "intake" interviews in the course.

French for Business and Economics Students Designed for students interested in international business, the program offers a thorough study of grammar, insights into the French way of life, specialized vocabulary related to the business world, and an introduction to French business texts. The course is a preliminary step for the student wishing co-op placement in France. Additional information may be obtained from Juliette Gilman, 362 Holmes Hall, 617-437-3659.

■ Marine Biology

East/West Marine Biology Program The East/West Marine Biology Program allows advanced undergraduate and beginning graduate students in biology and related areas to spend a year of field study in three diverse marine environments.

The program begins in the fall in Friday Harbor, Washington, on San Juan Island. The Pacific Northwest coast is noted for its giant kelp, diverse marine invertebrates, fish, birds, and marine mammals. While living at the University of Washington's Friday Harbor Laboratories, students study invertebrate zoology, marine birds and mammals, marine botany, and ocean and coastal processes—subjects that offer a foundation for the tropical and East Coast marine biology courses that follow. Credit is given for independent research projects in any or all of the three quarters.

In January, students travel to Jamaica to study tropical biology at the Discovery Bay Marine Laboratory on the island's north coast. The laboratory is located on the shore, within walking and swimming distances of rich coral reefs and sandy bays interspersed with beds of turtle grass. Coursework focuses on the tropical environment while building on the comparative aspects of field biology. Field trips to the montane forests, lectures on the island's terrestrial ecology, and the experience of Jamaican culture are important parts of the program.

Students travel to Northeastern University's Marine Science Center for the final phase of the program. They live in private housing near the Marine Science Center at East Point, Nahant, north of Boston. The laboratory is located on 20 acres of open land at the end of a rocky point extending into the Atlantic Ocean. During spring quarter, courses focus on the marine plants and animals of New England while emphasizing advanced and comparative aspects of marine biology, benthic ecology, and the behavior of marine animals.

Marine Science Center Summer Program in Marine Biology The summer program allows students to participate in intensive two-and-a-half week courses at the Marine Science Center (MSC). Summer course offerings include two introductory courses: Introduction to Marine Biology and Focus on the Sea: Issues and Nature. More advanced courses offered for biology majors or graduate students include Marine Birds and Mammals, Biology of Fishes, Larval Ecology of Marine Invertebrates, Diving Research Methods, and Developmental Biology of Marine Invertebrates. Its access to sites where marine organisms are easily collected makes the MSC laboratory an attractive location for both introductory and advanced courses. Field biology, the use of living marine organisms, is emphasized in laboratory-based courses and field trips.

Students conduct independent research at the MSC laboratory throughout the year. Resident and visiting faculty supervise a variety of research topics. Graduate students from other universities are encouraged to use the laboratory and field sites for thesis research. For more information about the Marine Science Center, see page 188.

Marine Studies Minor See page 83.

Massachusetts Bay Marine Studies Consortium Northeastern University is a member of the Massachusetts Bay Marine Studies Consortium. The consortium's offerings are interdisciplinary and seek to bridge academic disciplines and current concerns in the marine world. The consortium serves the students and faculty of 22 Boston-area colleges and universities. While students may register at Northeastern for these courses, students from all Greater Boston colleges may take these classes, which are taught by specialists and government officials.

Four courses are offered. A Maritime History of New England surveys that area's marine legacy from the earliest Indian fisheries to shipbuilding to modern commerce. Into the Ocean World: Marine Studies Seminar takes an interdisciplinary approach to marine systems, starting with Boston Harbor as a case study. Water: Planning for the Future focuses on local and global water issues. Marine Mammals: Biology and Conservation is taught at Boston's New England Aquarium. For more information, contact Dr. Peter S. Rosen, Department of Geology, 617-437-4380.

■ Interdisciplinary Minors

The College of Arts and Sciences offers upperclass students several choices of minor. Minors offered through single departments are explained in the description of the relevant department. Descriptions of interdisciplinary programs follow.

Asian Studies The Asian Studies Minor draws together studies in the Departments of Art, History, Modern Languages, Philosophy and Religion, Political Science, and Sociology/Anthropology. Among courses offered are history, language, philosophy and religion, political science, sociology, and anthropology. The director of the Center for Asian Studies coordinates the Asian Studies Minor. For more information, see page 187.

Business The College of Business Administration (CBA), in collaboration with the College of Arts and Sciences, offers a business minor for students outside CBA. This minor may be valuable to students seeking jobs in the public or private sector.

Courses in the minor cover substantially the areas required by the American Assembly of Collegiate Schools of Business as part of the relevant “common body of knowledge.” With the exception of accounting, the business courses included are the same as those taken by all students in the College of Business Administration.

For details, including full requirements and program admission standards, contact the Office of Undergraduate Programs of the College of Business Administration.

Cinema Studies The cinema studies minor may serve as an introduction to film for students interested in graduate study in film scholarship and/or filmmaking. Cinema studies enables students to develop analytical skills and critical tools to study relationships between film and society, history, aesthetics, philosophy, and psychoanalysis. Cinema studies courses are selected from the departments of Art and Architecture, English, History, Modern Languages, Music, Sociology/Anthropology, Speech Communication, and Theatre. In addition to satisfying requirements in film analysis, film theory, and filmmaking, students pursuing a minor choose courses from departmental offerings.

Linguistics Courses are selected from the departments of English, Modern Languages, Philosophy and Religion, Sociology/Anthropology, and Psychology. The program offers an interdisciplinary minor that reflects the research of such specialists as linguists, sociologists, psychologists, language educators, speech pathologists, neurologists, and teachers of second languages. The linguistics minor complements the study of any other language-related area, such as computer science, anthropology, brain physiology, or language teaching. Specialized concentrations within linguistics include psycholinguistics, stylistics, language and culture, second-language teaching and applied linguistics, theoretical linguistics, and American Sign Language linguistics. Many research opportunities exist through directed work-study.

Marine Studies The marine studies minor provides a program in the multidisciplinary aspects of the marine environment. The program identifies and uses marine-related courses and programs throughout the University and the New England area. Students from any major who have an interest in the marine environment may participate. Students from such areas as journalism and engineering have completed the minor, as have students in the sciences. The program allows an emphasis in either the scientific or social science/humanistic study of the oceans. Some physical interaction with the sea through achievement in a marine-related skill and an independent project are required of all participants. Dr. Peter S. Rosen, Department of Geology, is coordinator of the marine studies minor. For more information, telephone 617-437-4380.

Media Studies Media studies courses are selected from the departments of Political Science, Music, Speech Communication, Art and Architecture, Theatre, History, and English, and the School of Journalism. Each student satisfies requirements in the background and theory of mass media, then completes courses in media production and media application.

Russian Studies The Russian studies minor is an interdisciplinary program that provides students with an opportunity to develop a broad understanding of the Soviet Union and Eastern Europe. Through the study of language, literature, society, history, economy, culture, and behavior, students can learn about the people of this enormous region. The minor may help prepare students for graduate study or employment in such areas as government, teaching, journalism, and business.

Technical Communication Technical communication combines written, oral, and graphics skills with a background in science or technology. The minor in technical communication helps students prepare to be technical writers or to enter careers in which technical communication is a significant part of their jobs. Students in English or other liberal arts studies may elect the minor, as may students from technological or scientific fields.

Women's Studies The Women's Studies Program enables students to approach various disciplines from the perspective of women. It is an interdisciplinary program that incorporates scholarship on women's and men's roles in society and examines the importance of gender in past and present societies. Students examine traditional stereotypes and changing roles; learn about women in history, culture, and politics; and consider the changing situation of men and women today. The Women's Studies Program coordinates the Boston Area Colloquium on Feminist Theory, organizes an in-house lecture series, produces the Working Papers in Gender Studies Series, and sponsors the International Research Associates in Women's Studies for visiting scholars. The program also maintains liaisons with the student-run Women's Center at Northeastern. For more information, contact Dr. Laura L. Frader, Department of History, 617-437-4442.

■ American Sign Language Programs

The Sign Language Program, affiliated with the Department of Modern Languages, offers day and evening courses in American Sign Language (ASL) conversation and interpretation. Courses in the structure of ASL, deaf culture, deaf history, ASL literature and ASL linguistics, and sign language teaching are also offered. Conversation courses include features typically found in second-language curricula: vocabulary, grammatical structure, and the culture of the target language group. Each course provides an opportunity for students to interact directly with deaf people, observe ASL in use, and practice signing skills. The program uses instructional media for individualized practice on receptive skills and vocabulary review.

Related Degree Programs American Sign Language courses are an integral part of the B.A. in human services with a specialization in deaf studies and the B.A. and B.S. degrees in linguistics. The deaf studies specialization within the Human Services Program addresses an increasing need for human services professionals with knowledge of the deaf community and skills in American Sign Language. Students interested in working with deaf people may consider a B.A. degree in this area. See also the Human Services section on page 71.

The linguistics major is a comprehensive introduction to the study of language reflecting the research of linguists, sociologists, psychologists, language educators, and teachers of second languages. The major offers the special opportunity to work toward a B.S. degree focusing on American Sign Language or applied areas of ASL linguistics. See also the Linguistics section, page 72.

Interpreter Education Project Northeastern University is one of ten recipients of a five-year grant from the U.S. Department of Education, Rehabilitation Services Administration, for the purpose of developing and coordinating interpreter train-

ing activities to serve Connecticut, Massachusetts, New Jersey, and New York, and to develop on-campus programs at Northeastern University. The project's goals are to design and propose a five-year bachelor's degree in sign language interpreting, coordinate and provide short-term interpreter training opportunities, and design and pilot a six-month interpreter apprenticeship for newly trained interpreters.

Sign Language Teacher Training Program As the New England regional training program under the National Association of the Deaf National Consortium of Programs for the Training of Sign Language Instructors, Northeastern University offers programs to train teachers of ASL. The Summer Program for the Training of Sign Language Instructors offers an intensive introduction to the professional teaching of ASL as a second language. It is designed for current and prospective teachers already fluent in ASL.

Visiting Students Program Programs are available for students who wish to visit the University and become involved in an intensive exposure to ASL linguistics. These students can take courses in linguistics and ASL, as well as participate in directed studies and ongoing ASL research projects in the Language and Cognition Laboratory of the Department of Psychology.

■ Performing and Visual Arts

The Division of Performing and Visual Arts includes three undergraduate academic departments—Art and Architecture, Music, and Theatre—and the nonacademic African-American Master Artists-in-Residency Program (see the following description). Under its *nuArts* banner, the division produces professional visual and performing arts programs in a variety of media, among them the annual *nuArts* Performance Series.

The division also manages the University's performing arts facilities, which include the Blackman Auditorium Theatre Complex, and operates the *nuArts* Ticket and Information Center. Tickets to and information about performing and visual arts events are available here, as are tickets and passes to local dance, music, theatre, film, and visual arts events. The division maintains a University membership at the neighboring Museum of Fine Arts entitling all undergraduate students in the Basic Colleges to free membership privileges.

The Division of Performing and Visual Arts produces programs in film, music, visual arts, theatre, and multimedia performance. Augmenting these programs are performances by the division's artists-in-residence companies, which currently include the Boston Chapter of the League of Composers—International Society for Contemporary Music and the New England Composers Orchestra (see page 86). The division reaches national and international audiences through a weekly musical radio program, "A Note to You," produced in association with WGBH-FM radio, Boston, for broadcast distribution by the National Public Radio network.

To promote the arts on campus, the division publishes season brochures, event announcements, and various other informational materials.

For information about the academic programs within the Division of Performing and Visual Arts, see pages 48–51.

African-American Master Artists-in-Residency Program The African-American Master Artists-in-Residency Program (AAMARP) is a multicultural professional department within the Division of Performing and Visual Arts. The only program of its kind in the country, AAMARP provides the best aesthetic presentations from a wide spectrum of artists. Although its artistic residencies, which provide studio space and exhibitions for individual artists, are limited to persons of color, its galleries and commu-

nity spaces are open to all. Since 1978, the AAMARP facilities have housed dozens of African, Asian, Hispanic, European, and Native American exhibitions, performances, and special programs from artists in the Boston area and throughout the nation.

League of Composers—International Society for Contemporary Music The Boston Chapter of the League of Composers—International Society for Contemporary Music (League—ISCM) is an artists-in-residence program within the Department of Music and is one of the oldest and most prestigious international organizations dedicated to the promulgation of new music. With chapters in more than 40 countries and a membership that has included Schönberg, Stravinsky, Bartók, and Ravel, the League—ISCM has introduced the public to works of some of the most important twentieth-century composers. Under the direction of Kyle Hoepner, the league's activities include an annual concert series; co-sponsorship with the Department of Music of the annual Leo Snyder Memorial Award in Composition and Concert; production of *New Music—Boston*: a calendar listing of Boston's new music activities; and publication of *Essays on Modern Music*, an annual monograph featuring articles on contemporary music written by composers, new music scholars, and critics.

New England Composers Orchestra The New England Composers Orchestra (NECO) is an artists-in-residence program affiliated with the Department of Music and the Division of Performing and Visual Arts. The Boston-based organization is composed of 60 professional musicians formed for the purpose of studying new works by New England composers. The works are chosen through competition each year and then rehearsed, taped, and discussed in a series of open rehearsals, known as “readings,” which are held at Northeastern and are open to the public.

New England Conservatory Affiliation A limited number of qualified Arts and Sciences students may take courses at the New England Conservatory as part of the regular course load and tuition fee at Northeastern. This arrangement enables Northeastern students who qualify to enhance their cultural life with the richness of music education that is the hallmark of the Conservatory. Northeastern students who participate in this program, as well as any student majoring in music, are also given full library privileges to the Conservatory.

Students interested in this program should contact Professor Joshua Jacobson, Chairman of the Department of Music, at 617-437-2440.

■ Teacher Preparation Option

On October 1, 1994, a two-stage teacher certification process will go into effect in Massachusetts. Students planning to teach in secondary school can complete the requirements for application to the first stage, Provisional Certification, while they are undergraduates. Such students should major in an Arts and Sciences area and take a specific minor in Education that includes coursework and practice teaching. Advisers in the College of Arts and Sciences are available to assist students in working out their programs.

■ Journals

Essays on Modern Music An annual monograph series of the League of Composers—International Society for Contemporary Music, *Essays on Modern Music* is published through the University's Division of Performing and Visual Arts. The monographs feature articles on topics in contemporary music. Essays are written by composers, new music scholars, and critics. Articles cover specific composers, historical eras, and other topics of interest to the general reader, music students, and scholars.

New England Quarterly Published since 1928, the *New England Quarterly* is America's leading historical review of New England life and letters. Each issue presents major articles in the fields of literature, history, and culture; a special feature of brief memoranda and recently discovered documents; and a book review section.

Nineteenth-Century Contexts The journal of the Interdisciplinary Nineteenth-Century Studies (INCS), *Nineteenth-Century Contexts*, publishes articles emphasizing an interdisciplinary approach to topics and issues in nineteenth-century studies. It also presents reviews and a forum on subjects of interest to scholars. Formerly *Romanticism Past and Present*, the journal, co-edited by Professor Stuart Peterfreund of the English Department, has broadened its scope to encompass the full century and to include disciplines such as philosophy, history, art history, and musicology.

The Scriblerian Founded in 1969, *Scriblerian* is published in the autumn and spring by Northeastern's and Temple University's English departments. A semiannual news journal devoted to research on the Augustan Age of English literature (1660–1750), it prints reviews and articles on such figures as Dryden, Pope, Swift, Defoe, Fielding, Richardson, Smollett, and Sterne. Its Northeastern editor is Dr. Arthur J. Weitzman. The journal is affiliated with and financially supported by Queen's University (Kingston, Ontario), the University of Florida (Gainesville), and the University of Calgary (Alberta).

Studies in American Fiction A publication that presents articles, notes, and reviews on all aspects of American prose fiction, *Studies in American Fiction* has a readership and contributors who represent an international community of literary scholars. The journal's purpose is to publish discoveries in, documents on, and new interpretations of important works of American fiction. The publication of Volume 18 in 1990 marked nineteen years of Northeastern's sponsorship of *Studies in American Fiction*, the first scholarly journal to be published by the University.

School of Journalism



LaRue W. Gilleland, M.A., *Professor and Director*

Associate Professors

Patricia A. Kelly, Ph.D.
William Kirtz, M.S.

Assistant Professors

Jerome M. Berger, M.S.
Nicholas Daniloff, M.A.
Charles F. Fountain, M.S.
Nancy Gallinger, M.A.

Kelly C. Hunn, M.S.

Andrew P. Jones, M.S.
James Ross, M.A.
William Smith, J.D.
Linda Conway Tompkins, M.A.

Degrees Offered: Bachelor of Arts, Bachelor of Science

The School of Journalism, a unit of the College of Arts and Sciences, prepares students for careers in news media and related fields. However, the skills it emphasizes in writing, editing, information gathering, photojournalism, and design and graphics have broad applications in numerous other disciplines.

The school also seeks to contribute to the existing body of knowledge in journalism and mass communications in areas that will help news media practitioners and educators perform their jobs with increasing effectiveness. By cooperating with media and related agencies, the school sponsors professional workshops and seminars that students are invited to attend.

■ Professional Preparation

Journalism provides many exciting, rewarding career opportunities. Northeastern journalism graduates work for some of the world's best newspapers, news departments of radio and television stations, wire services, general and specialized magazines, public relations departments, and advertising agencies.

Because journalism skills can be better expanded and understood with the aid of a laboratory, upperclass students who major in journalism are encouraged to participate in the Cooperative Plan of Education. Co-op assignments with newspapers, radio and television stations, news bureaus, advertising agencies, and public relations offices provide practical laboratory experience important in helping students prepare for careers in mass communications. Such experience also offers an advantage to those who decide to seek admission to a graduate program.

■ The Program

The school offers four undergraduate concentrations:

- advertising;
- newspaper/print media;
- public relations;
- radio/television news.

Students have the option of enrolling in either a Five-Year Cooperative Education Program or a four-year program without co-op. Cooperative education experience, however, is strongly advised.

The school offers the bachelor of arts and bachelor of science degrees. Candidates for either degree must satisfy three groups of requirements: those for their concentration, those for the common core of professional courses (Newswriting, Law of the Press, History of Journalism, Photojournalism, and Journalism Ethics), and those for the College of Arts and Sciences core curriculum. (See page 44.) In addition, the bachelor of arts has a foreign language requirement.

A journalist should have a broad background of liberal arts courses. At Northeastern, the formula for a bachelor's degree in journalism is a combination of 75 percent arts and sciences courses and 25 percent professional courses. The ideal schedule is one or two journalism courses each quarter, with additional work in the humanities, social sciences, physical sciences, and economics.

■ Honors Program See page 19.

■ Graduation Requirements See page 45.

■ Graduation with Honors See page 41.

■ Facilities

The school's facilities include a design and graphics lab, a photojournalism darkroom, and newswriting and editing labs containing computer equipment found in many major publishing companies. The school also shares a television/media studio with a number of other academic departments.

■ Affiliations

The New England Press Association (NEPA), representing 350 newspaper publishers, maintains its office on the Northeastern campus. Students have the opportunity to attend seminars and conferences sponsored by NEPA and other organizations.

■ Graduate Education For information on graduate degrees in journalism, see page 182.

Boston-Bouvé College of Human Development Professions



Paul M. Lepley, Ed.D., *Dean*

Arlene T. Greenstein, Ph.D., *Associate Dean for Academic Affairs*

Michael E. Gladstone, M.B.A., *Assistant Dean*

Cornelius B. O'Leary, M.Ed., *Director of Graduate Admissions*

Boston-Bouvé College of Human Development Professions offers students the quality instruction, guidance, and practical experience essential to practitioners in the human development professions. Typically, students share a commitment to improve the quality of life whether they are in community, recreational, clinical, or educational settings. In the Human Services Program, undergraduate programs are offered in education; health, sport, and leisure studies; and physical therapy.

Boston-Bouvé offers students the advantages of a small college—individual attention and encouragement—within the framework of a large university.

■ **Five-Year Cooperative Education Program**

Freshmen receive a solid grounding in the liberal arts and sciences. Sophomores are introduced to specific competencies that are developed and expanded throughout the program. In the middler, junior, and senior years, professional theory and practices are emphasized.

Cooperative education is an integral part of all programs. Beginning in the sophomore year, each curriculum is enriched by cooperative education work experiences for two of the four quarters in an academic year. Co-op jobs afford students the opportunity to synthesize knowledge and skills through supervised work in clinical practice, student teaching, field experience, or internship.

■ **Honors Program** See pages 19–20.

■ **Honor Societies**

College of Human Development Professions Honor Society, Eta Sigma Gamma (Department of School and Community Health Education), and Kappa Delta Pi—see page 203.

■ **Graduation Requirements**

Degrees Students in the programs for early childhood education, elementary education, human services, community health education, physical education teacher preparation, and school health education earn a Bachelor of Science in Education. Students in the recreation management program are awarded the Bachelor of Science in Recreation and Leisure Studies. Students graduating in physical therapy receive the degree of Bachelor of Science in Physical Therapy. Students majoring in Athletic Training and Cardiovascular Health and Exercise earn a Bachelor of Science degree.

Student teaching, field experience, or clinical practice is an integral part of each student’s curriculum, and satisfactory completion is required for graduation. Students must satisfy the requirements of the Department of Cooperative Education. All majors require demonstration of computer literacy and satisfactory completion of the Middler-Year Writing Requirement, in addition to the other University and college requirements. Senior-year coursework and required experiences must be completed in full-time residence at Northeastern or in an educational setting approved by the college.

Quantitative The quarter hours required in each curriculum vary.

Education

Early Childhood Education 176
Elementary Education 176–185

Health, Sport, and Leisure Studies

Athletic Training 185
Cardiovascular Health and Exercise 176
Community Health Education 178
Physical Education Teacher Preparation 177
Recreation Management 174
School Health Education 176

Human Services

Human Services 176

Physical Therapy

Physical Therapy 187

Qualitative Throughout the professional sequence, students must maintain required averages and demonstrate a high level of personal and professional maturity. Because of accreditation recommendations and differences in curricula, variations in qualitative requirements may occur. The overall cumulative quality-point averages required to enter each class level are stated in the *Student Handbook*.

Transfer students in any curriculum may be accepted into the college at upperclass levels if space is available. Transfer into the physical therapy program is limited to the freshman and sophomore years. Each transcript is individually assessed for qualification, placement, and program design. For more information on transferring, see the Transfer Students section, page 14.

■ **Graduation with Honors** See page 41.

■ **Facilities**

The remodeled and expanded facilities of the Department of Physical Therapy are located in Mary Gass Robinson Hall. Dockser Hall houses a gymnasium, a dance studio, computer rooms, an exercise physiology laboratory, locker and shower facilities, and a kinesiology laboratory. The swimming pool, weight room, handball/racquetball courts, and locker and shower facilities are located in Barletta Natatorium. Cabot Physical Education Center houses a large gymnasium, an indoor running track, tennis courts, fitness rooms, instruction in weight training and the martial arts, and the Kerkor “Koko” Kassabian Athletic Training Laboratory.

The Russell J. Call Children’s Center provides day care for children from two years and nine months to five years of age and a laboratory setting for students seeking teacher certification. Children’s literature and related learning resource materials are housed in the F. André Favat Center and Library of Children’s Literature (see page 191).

The Lupean Professional Library maintains an up-to-date collection of physical therapy and medical textbooks and periodicals that supplement the University library. The clinical anatomy laboratory, five classroom laboratories, and two research laboratories are designed and equipped for the study of human anatomy, the practice of clinical procedures, and research.

The Hearing, Language, and Speech Center serves clients ranging from toddlers to the elderly. Diagnostic evaluations and treatment are provided to clients who demonstrate a variety of communication disorders. Students may also engage in academic research in communication disorders. The Communications Research Laboratory provides an array of up-to-date equipment and computer technology to aid students in generating, analyzing, and compiling the results of their work.

The Warren Center serves as a practical laboratory and as a recreation center for the college. Its athletic fields, tennis courts, ropes course, cross-country ski trails, winterized cottages, and Hayden Lodge provide year-round opportunities for outdoor learning 25 miles from the Boston campus. Freshman orientation, courses, seminars, and workshops are conducted at the center throughout the year.

■ **Fieldwork, Student Teaching, Clinical Practicums, and Internship Prerequisites**

Each major area of study requires satisfactory completion of specified prerequisites before assignment to fieldwork, student teaching, clinical practicum, or internship. For certain programs students must be covered by professional liability insurance (purchased for a moderate fee through the University). In the fourth year, before the first supervised clinical education experience, physical therapy students must be examined by physicians in the University Health Services (again, at a moderate fee) or by a personal physician. Students in programs offered by the Department of Education and the Department of Health, Sport, and Leisure Studies must present evidence that they are free of tuberculosis before engaging in student teaching. For more details on medical requirements, see pages 17 and 200.

■ **Licensure/Registration**

All 50 states have laws governing the practice of physical therapy. To be eligible to practice physical therapy, graduates must meet the specific legal requirements of the state in which they wish to practice. In most states the requirements include graduation from an accredited school of physical therapy and a satisfactory grade on a licensure examination. Graduates are responsible for determining what the specific legal requirements are in the state in which they seek employment.

■ **Certification**

Upon successful completion of the programs in early childhood education, elementary education, school health education, and physical education, students are eligible to apply for certification by the Commonwealth of Massachusetts. Certification is required for public school teaching, but does not guarantee a position. Reciprocal certification is available in many states. Graduates are responsible for determining the requirements of the states in which they are interested.

■ **Graduate Education** For information on graduate degrees, see page 182.

Department of Education

Maurice Kaufman, Ph.D., <i>Professor and Chairman</i>		
<i>Professors</i>	<i>Associate Professors</i>	Barbara A. Schram, Ed.D.
John D. Herzog, Ph.D.	Nicholas J. Buffone, Ph.D.	<i>Assistant Professors</i>
Mervin D. Lynch, Ph.D.	Leslie A. Burg, Ed.D.	Thomas H. Clark, M.A.
Sandra M. Parker, Ed.D.	Mary J. Lee, M.Ed.	Carlton B. Lehmkuhl, Ph.D.
	Joseph Meier, Ed.D.	
	Irene A. Nichols, Ed.D.	
<i>Degree Offered:</i> Bachelor of Science in Education		

■ **Professional Preparation**

The Department of Education provides teacher preparation programs in a variety of fields and at several levels. It also offers basic and advanced courses in the humanities and behavioral sciences for students in education, human services, and other human development professions.

■ **Five-Year Cooperative Education Program**

Effective October 1, 1994, all students seeking teacher certification at any grade level (N–12) will need to earn a bachelor's degree with a major or interdisciplinary major in the liberal arts and sciences. Students seeking certification as an early childhood or an elementary teacher will complete a joint program between the College of Arts and Sciences and Boston-Bouvé College of Human Development Professions.

Early Childhood Education Students seeking certification in early childhood education will enter a dual-major program consisting of a major in the College of Arts and Sciences and an early childhood education major in Boston-Bouvé College. This broad academic background, combined with experiences in cooperative education, permits the development of a cohesive professional base. Pre-student teaching in appropriate field settings is an integral part of several required courses. The Russell J. Call Children's Center provides experiences in fieldwork for students in the early childhood education program.

Elementary Education Students who will be candidates for certification as elementary education teachers will enter a dual-major program consisting of a major in the

College of Arts and Sciences and the elementary education major in Boston-Bouvé College. The competencies necessary for teaching come from coursework, experiences in the Cooperative Plan of Education, prepracticum field activities, and the student-teaching practicum.

Secondary Education Certification candidates must complete a major and certain core requirements in the College of Arts and Sciences and a minor in secondary education. Students preparing to teach biology, chemistry, earth science, English, history, mathematics, physics, or Spanish in the schools of Massachusetts can major in these respective fields. Those majoring in economics, philosophy, political science, or sociology may pursue state certification in the teaching of social studies.

Specified competencies established for certification in Massachusetts may be acquired through cooperative education experiences, designated courses, and full-time student teaching, arranged by the Department of Education.

■ **Accreditation**

The elementary education, early childhood education, health education, and physical education teacher preparation programs are accredited by the Massachusetts Department of Education.

■ **Requirements for Teacher Preparation***

Early Childhood Major

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Education for the Future	4	Elementary School Science and Mathematics	4
Human Development and Learning I	4	Student Teaching	8
Analysis of the Instructional Process	4	Introduction to Special Education	4
Day Care and Nursery School	4	Early Childhood Perceptual Motor Development	4
Language and Cognition	4	Beginning Computer Use	4
Measurement and Evaluation	4	Professional Development	1
Seminar in Early Childhood Development	4	Middler-Year Writing Requirement	4
Fundamentals of Reading	4		
Literature and Learning Materials	4		
Elementary Curriculum I and II	8		

Elementary Education Major

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Education for the Future	4	Student Teaching	8
Human Development and Learning I	4	Introduction to Special Education	4
Analysis of the Instructional Process	4	Movement Education	1
Measurement and Evaluation	4	Beginning Computer Use	4
Fundamentals of Reading	4	Professional Development	1
Literature and Learning Materials	4	Middler-Year Writing Requirement	4
Elementary Curriculum I and II	8	Designated Electives	8
Elementary School Science and Mathematics	4		

*Minimum graduation requirements: early childhood major—177 Q.H.; elementary major—176 Q.H.; with secondary education minor—176 Q.H.

■ **Student Teaching**

Student teaching is a full-time experience for one quarter of the senior year. A professor and a cooperating classroom teacher share supervisory responsibility.

■ **Teacher Certification**

As of October 1, 1994, all students seeking teacher certification at any grade level (N–12) in the Commonwealth of Massachusetts will need to earn a bachelor's degree

with a major or interdisciplinary major in the liberal arts and sciences. In addition, candidates for provisional certification will need to provide evidence that appropriate coursework in education as well as prepracticum and student teaching assignments have been successfully completed.

The requirements for obtaining certification vary from state to state. Students are responsible for determining the requirements of the states in which they are interested.

Department of Health, Sport, and Leisure Studies

Carl S. Christensen, Ph.D., *Professor and Chairman*

Associate Professors

Marilyn A. Cairns, Sc.D.
Robert S. Curtin, Ed.D.
Kathleen Davis, Ph.D.
M. Patricia Fetter, Ph.D.
William J. Gillespie, Ed.D.
Dorett M. Hope, Ed.D.

Richard B. Morrison, Ed.D.
Judith A. Noblitt, M.Ed.

Assistant Professors

George R. Atkinson, Ed.D.
Glenn A. Boden, M.Ed.
D. Sue Graham, Ph.D.
Donald Schneider, Ph.D.

Charles A. Starkey, Ph.D.
Makoto Tsuchiya, M.S.

Lecturers

Wendy Gammons, M.S.
Peg Stacey, M.S.

Degrees Offered: Bachelor of Science, Bachelor of Science in Education,
Bachelor of Science in Recreation and Leisure Studies

The department provides program specializations and services, conducts research, and disseminates findings on how health, sport, and leisure improve the quality of life. Faculty are committed to pre- and in-service preparation of practitioners to serve people of all ages and also to the scholarly investigation related to the five program specializations offered by the department.

■ **Five-Year Cooperative Education Programs**

The department offers programs in athletic training, cardiovascular health and exercise, school and community health education, physical education teacher preparation, and recreation management. All students in this department are expected to maintain a specific quality-point average at each class level (see the *Student Handbook for the Basic Colleges*).

Athletic Training

Degree Offered: Bachelor of Science

■ **Professional Preparation**

The athletic trainer plays an important role not only in professional sports, but also in the organized and recreational activities of people from all walks of life. An important link between the athlete, the coach, and the physician, the athletic trainer provides services in preventing, treating, and rehabilitating sports injuries. The trainer's duties include advising on proper conditioning techniques to help reduce injury, assessing the severity of injuries that do occur and administering basic first aid, and supervising post-injury rehabilitation programs.

In general, athletic trainers work in sport medicine clinics and organized sports—either for secondary school or college athletic teams or for professional teams engaged in a variety of sports.

■ **Five-Year Cooperative Education Program**

This five-year Bachelor of Science in Education program is designed for students

interested in careers as athletic trainers. The program is approved by the National Athletic Trainers Association.

Students interested in the athletic training program major must be accepted into Northeastern's Department of Health, Sport, and Leisure Studies (see Undergraduate Admissions, page 7). Students may petition for acceptance into the athletic training program after successfully completing their first year of academic study. To be accepted into the program, applicants must maintain at least a 1.85 (C+) quality-point average during their second year. In order to complete the athletic training program, students must complete a minimum of 1,000 hours' work with athletic teams in approved settings.

■ **Accreditation**

The professional program specialization in athletic training is approved by the National Athletic Trainers Association.

■ **Certification**

Students who graduate from the athletic training program are eligible to sit for the National Athletic Trainers Association Certification Examination. Upon passing the examination, an individual may apply for Massachusetts licensure in athletic training. Certification does not guarantee a position in the profession.

■ **Course Requirements***

General (Freshmen—year one)

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
English I and II	8	Foundations of Psychology	4
Biology I and II	8	Computer Use	4
Chemistry I and II	10	First Aid	2
Mathematics	4	Issues in Health	4
Social Science I	4	Elective	4

Upperclass (years two—five)

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Anatomy/Physiology I and I	8	Kinesiology	4
Introduction to Counseling	4	Statistics	4
Physics I and II/Labs	10	Neuroscience	4
Basic Athletic Training	3	Middler-Year Writing Requirement	4
Basic Athletic Training Lab	1	Therapeutic Reconditioning	4
Clinical Athletic Training	2	Motor Development	4
Research Methods	4	Administration of Athletic Training	4
Exercise Physiology	4	Nutrition	4
Advanced Athletic Training I and II	8	Psychology of Sport	2
Physical Conditioning Programming	2	Overview of Disabilities	4
General Studies electives	16	Athletic Training Practicum I, II, III, IV	12
Senior Seminar	4	Drug Use and Abuse	4
Therapeutic Modalities	4	Mental Health	4
Weight Training	1	Special Problems	4

*Graduation requirements—185 Q.H. pending curriculum revisions.

Cardiovascular Health and Exercise

Degree Offered: Bachelor of Science

■ **Professional Preparation**

Students interested in careers as preventive/rehabilitative exercise technologists and specialists in private and public agencies, commercial health and fitness centers,

hospitals and outpatient clinics, or businesses and corporations may obtain a bachelor of science degree in this program.

■ **Five-Year Cooperative Education Program**

The program specialization in cardiovascular health and exercise focuses on how the health and exercise sciences relate to physical fitness, health promotion, and primary and secondary prevention of cardiovascular disease. To the applied science base, students add courses designed to help them acquire the knowledge and skills necessary for physical and health assessment, exercise testing, exercise prescription, and program development and supervision for adults in preventive and rehabilitative health and exercise programs.

■ **Certification**

Successful completion of the program specialization prepares the student to sit for the certification examination for preventive/rehabilitative exercise technologist or specialist conducted by the American College of Sports Medicine.

■ **Course Requirements***

General (Freshmen—year one)

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Computer Use	4	Mathematics	4
Biology I and II	8	Current Health Issues	4
English I and II	8	First Aid	2
Psychology	4	Weight Training	1
Sociology	4	Swimming	1
Chemistry I	5	Physical Conditioning	1
Health Elective	4	Aerobic Exercise	1

Upperclass (years two–five)

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Anatomy/Physiology I and II	8	Introduction to Counseling	4
Motor Development or Psychology II	4	Research Methods	4
Chemistry II	5	Exercise Physiology	4
Basic Athletic Training	3	Commercial Recreation Marketing	4
Physics I/Lab	5	Budget Analysis	4
Communicable/Degenerative Diseases	4	Exercise Testing Prescription	4
Health Counseling	4	Electrocardiography	4
Community Health	4	Health and Exercise Programming	4
Special Problems	4	Nutrition	4
Kinesiology	4	Middler-Year Writing Requirement	4
Wellness	4	Supervised Field Experience	12
Statistics	4	Electives	20

*Minimum graduation requirement—176 Q.H. and a grade of C (2.0) or better in selected professional courses.

Note: A Q.P.A. of 2.0 or better is required prior to field experience.

Physical Education Teacher Preparation

Degree Offered: Bachelor of Science in Education

■ **Professional Preparation**

Physical education students who prepare for professional careers as elementary and secondary physical education teachers and coaches in public and private schools need not be limited to those careers. Their expertise is often welcomed in community

agencies, business, government, and industry, where the need exists for physical activity, sports, fitness, and health entrepreneurs.

■ **Five-Year Cooperative Education Program**

Students in this program must select a major from within the College of Arts and Sciences (such as anthropology, history, psychology, or sociology) to augment extensive coursework in physical education (theoretical foundations, applied science, pedagogy, and activity courses). Accordingly, each student has two advisers, one from Physical Education and one from Arts and Sciences.

Field experience comes both as an extension of regular coursework and from student teaching. Student teaching follows the completion of several major courses in pedagogy and must be consistent with the certification level being sought.

The combination of a broad liberal arts background, a technical specialization, and supervised practice teaching gives program graduates an advantage when applying for positions.

■ **Graduation Requirements**

Degree candidates must complete a minimum of 176 quarter hours and have a 2.5 quality-point average in all required department courses *prior to* supervised student teaching.

■ **Certification**

On October 1, 1994, the Commonwealth of Massachusetts implements a two-stage certification plan for all teachers (N–12). Provisional certification is the first stage; it must be followed by the completion of a master’s degree for full certification.

Provisional certification candidates must earn a bachelor’s degree with a major in liberal arts or sciences, provide evidence of the required coursework in physical education and the prepracticum, and provide evidence of successful completion of practice teaching.

Note Massachusetts is a member of the Interstate Certification Commission, an organization that oversees teacher certification reciprocity among many—but not all—states. Teacher certification requirements vary from state to state; candidates are responsible for determining the requirements of a particular state.

■ **Course Requirements***

General (Freshmen–year one)

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Introduction to Physical Education	4	Basketball	1
First Aid	2	Beginning Gymnastics	1
Computer Use	4	Track and Field	1
Intermediate Swimming	1	Arts and Sciences (Core and Major)	36

Upperclass (years two–five)

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Elementary/Secondary School Activities	4	Theory of Coaching or Dance	4
Anatomy/Physiology I, II	8	Soccer	1
Motor Development and Learning	4	Tennis	1
Kinesiology	4	Dance Elective	1
Critical Teaching Skills	5	Physical Conditioning	1
Middler-Year Writing Requirement	4	Volleyball	1
Exercise Physiology	4	Badminton	1
Overview of Disabilities	4	Student Teaching	8
		Arts and Sciences (Core and Major)	72

*Minimum graduation requirement—177 Q.H.

Recreation Management

Degree Offered: Bachelor of Science in Recreation and Leisure Studies

■ Professional Preparation

The academic and work experiences in recreation management are designed to help the student develop those skills most necessary to obtain entry-level management positions in commercial, government, and nonprofit recreation. Students wishing to continue their education seek admission to Master of Business Administration (M.B.A.), Master of Public Administration (M.P.A.) degree programs, or Master of Science in Sports or Recreation Management (M.S.).

The Cooperative Plan of Education provides opportunities for professional work experiences in health clubs, racquet clubs, resorts, tourism agencies, government, and nonprofit agencies.

■ Five-Year Cooperative Education Program

Academic work in the recreation management specialization emphasizes the behavioral sciences applied to leisure and managerial settings. An intensive in-residence program in leadership and human relations at the University's Warren Center, 25 miles west of Boston, serves as a practical laboratory (see page 92).

Equal emphasis is placed on developing a working knowledge of marketing, budgeting, planning, evaluation, and computer applications in the leisure industry. The case method of teaching is used to help students identify and solve problems facing recreation managers in the commercial and nonprofit sectors.

■ Course Requirements*

General (Freshmen—year one)

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Biology I	4	Foundations of Leadership and Leisure	
English I and II	8	Services	4
Social Science	4	Computer Use	4
Life/Career Planning	4	Education elective	4
Health Issues	4	Professional Skills	4
Group Dynamics	3	Mathematics	4
Speech Fundamentals	3		

Upperclass (Years two—five)

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Human Development I and II	8	Budget Analysis	4
Anatomy/Physiology I and II	8	Survey Recreation Facilities	4
Introduction to Recreation and Leisure		Organizational Behavior	3
Services	4	Management of Recreation and Physical	
Research Applications	4	Education	4
Program Planning	4	Program Evaluation	4
Commercial Recreation Marketing	4	Concepts of Leisure	4
Internship Seminar	1	Therapeutic Recreation elective	4
Internship in Recreation Management	12	Social/Psychological Aspects	
Senior Seminar	4	of Disabilities	4
Guided electives	20	Middler-Year Writing Requirement	4
Research Methods	4	Recreation and Leisure Electives	8
Behavioral/Social Science electives	8		

*Minimum graduation requirement—174 Q.H.

School and Community Health Education

Degree Offered: Bachelor of Science in Education

Health education is concerned with improving individual and community health through educational activities. Working in health agencies, public health clinics, schools, and health-planning organizations, health educators apply techniques and information from both medicine and education to help individuals and communities deal with emotional, physical, and social aspects of health.

■ Professional Preparation

Professional preparation in school health education differs from community health education in the application of fieldwork or internship experiences. The former applies fieldwork in school settings, while the latter applies fieldwork to agencies such as clinics, hospitals, or state and local health departments.

■ Five-Year Cooperative Education Program

The first part of the program emphasizes the foundations of health education in the social and life sciences. Practical experience enables students to apply theory and techniques. Courses on contemporary health issues probe the details and complexities of health topics. Students develop the ability to assess the needs of groups and to organize and evaluate effective educational activities. Prevention, health promotion, wellness, and holistic health are common threads of the program. Students may specialize in school health or community health education.

Students selecting an emphasis in school health education must meet state certification requirements for field experiences in prepracticums and the practicum in a secondary school setting. Both programs mandate a cumulative quality-point average of 2.5 in all required department courses.

■ Certification

School Health Education Upon successful completion of the requirements for graduation in school health education, students are eligible to apply for certification to teach (grades 5–12) in the Commonwealth of Massachusetts. On October 1, 1994, the Commonwealth of Massachusetts implements a two-stage certification plan for all teachers (N–12). Provisional certification is the first stage; it must be followed by the completion of a master's degree for full certification.

Provisional certification candidates must earn a bachelor's degree with a major in the arts or sciences, provide evidence of successful completion of the required coursework in health education, the prepracticum, and practice teaching.

Note Massachusetts is a member of the Interstate Certification Commission, an organization that oversees teacher certification reciprocity among many—but not all—states. Teacher certification requirements vary from state to state; candidates are responsible for determining the requirements of a particular state.

Community Health All students in community health education must satisfy departmental requirements for graduation. Graduates are eligible for positions in health agencies, government health programs, hospitals, or community centers.

Health Education The health education program is concerned with the health of the University community. The University regularly offers several elective courses on selected health issues of personal and professional interest, such as nutrition, sexuality, mental health, consumer health, drug use/abuse, and aging.

■ **Course Requirements***

General (Freshmen—year one)

<i>Course—Community Health</i>	<i>Q.H.</i>	<i>Course — School Health</i>	<i>Q.H.</i>
Chemistry I and II	10	Mathematics	4
English I and II	8	Psychology I	4
Sociology	4	Foundations of Health	4
Current Health Issues	4	First Aid	2
First Aid	2	Computer Use	4
Biology I and II	8	Arts and Science courses	
Foundations of Health	4	(Core and Major)	40
Psychology I	4		
Mathematics	4		
Physical Activity	1		
Elective	4		

Upperclass (years two–five)

<i>Course—Community Health</i>	<i>Q.H.</i>	<i>Course—School Health</i>	<i>Q.H.</i>
Psychology II	4	Health Concerns of Youth	4
Human Development I and II	8	Anatomy/Physiology I and II	8
Anatomy/Physiology I and II	8	Nutrition	4
Health Concerns of Youth	4	Mental Health	4
Research Methods	4	Middler-Year Writing Requirement	4
Drug Use/Abuse	4	Community Health	4
Communicable/Degenerative Disease	4	Drug Use/Abuse	4
Longevity and Aging	4	Teaching Procedures in Health	4
Community Health	4	Human Sexuality	4
Seminar I and II	4	Epidemiology	4
Middler-Year Writing	4	Student Teaching	12
Organization/Administration	4	Health Counseling	4
Health Counseling	4	Senior Seminar	2
Physical Activity elective	1	Arts and Science courses	
General Studies electives	16	(Core and Major)	52
Nutrition	4	Elective	4
Microbiology	4		
Analysis of Instruction	4		
Mental Health	4		
Epidemiology	4		
Computer Use	4		
Special Education	4		
Teaching Procedures in Health	4		
Human Sexuality	4		
Field Experience	12		

*Minimum graduation requirement—178 Q.H., community health; 176 Q.H., school health.

■ **Related Department Activities**

Physical Education Electives in sports, aquatics, and fitness activities are offered to all students. Classes are open to men and women, with instructional modifications where appropriate. Classes may be cancelled if enrollments are too low.

Health, Sport, and Leisure Club Organized by students in the department, the Health, Sport, and Leisure Club participates in projects of student interest that relate to departmental and professional concerns or issues. The club plans guest speakers, student workshops, information exchanges, orientation programs for new students, and a volunteer service for local programs.

Department of Physical Therapy

David A. Lake, Ph.D., *Associate Professor and Chairman*

Associate Professors

Meredith H. Harris, Ed.D.

Robert Sikes, Ph.D.

Assistant Professor

Mary D. Slavin, Ph.D.

Lecturer

Shirley A. Stockmeyer, M.A.

Clinical Supervisors

Clinical Instructors

Cindy I. Buchanan, M.S.

Ann L. Charrette, M.A.

Marguerite Geer, M.A.

Lisa M. Giallonardo, M.S.

Nancy B. Goldin, M.Ed.

Mary O'Brien, M.P.H.

Nancy L. Seaver, M.P.T.

Cooperative Education

Coordinators

Betsey W. Blackmer, Ed.D.

Ann C. Noonan, Ed.D.

Degree Offered: Bachelor of Science in Physical Therapy

The Department of Physical Therapy is dedicated to the preparation of therapists who can provide quality patient care in a time of changing concepts, trends, and challenges. Students may learn to help patients gain functional independence and to recognize and assist with emotional and socioeconomic problems affecting recovery.

■ Professional Preparation

Physical therapists are skilled in evaluation procedures and in the planning and execution of treatment programs appropriate to a patient's condition or disabilities. Additional responsibilities may include health-care planning and community service.

Physical therapists are employed in private practice or in such institutions as general hospitals, children's hospitals, university hospitals, rehabilitation centers, schools or centers for disabled children, extended-care facilities, freestanding outpatient clinics, home-health agencies, and community, state, and federal agencies. Teaching and research positions offer additional opportunities.

■ Five-Year Cooperative Education Program

The five-year program in physical therapy, based on the Cooperative Plan of Education, is unique in physical therapy education. Major emphasis in the first two years is on liberal arts and sciences; professional preparation is emphasized in the last three years. The professional courses include anatomy, kinesiology, pathology, clinical medicine, neurology, orthopedics, physiology, physical therapy procedures, administration, and research. In addition, clinical experience is provided in various hospitals and clinics.

Clinical specialists from Boston University School of Medicine, Tufts–New England Medical Center Hospital, Beth Israel Hospital, regional hospitals, and nearby medical and social agencies, augment the professional staff in the physical therapy program.

Clinical affiliation satisfies eligibility criteria for state licensure and provides opportunities to practice various facets of physical therapy under supervision. Assignments in clinical education include physical therapy departments and clinics across the United States. Students on clinical education assignments should plan on additional expenses, including travel.

Physical Therapy Club Organized by students, the Physical Therapy Club sponsors student, faculty, and guest presentations on professional issues and its members participate in open house activities, new student orientation, the Big Brother/Big Sister program, and departmental peer tutoring.

Requirements Students admitted to the Department of Physical Therapy must maintain acceptable standards of scholarship and performance in the prescribed program; demonstrate good health, verbal fluency, essential motor skills, professional

behavior, and emotional maturity; complete all required courses; and have favorable evaluations from clinical education and co-op experience. Students must maintain a grade of C (2.0) or better in all professional courses and all basic science prerequisite courses listed in the academic policy statement of the Department of Physical Therapy. Students may not continue in the program upon earning a grade lower than C in three different science and/or professional courses. An earned grade lower than C for the second time in the same science and/or professional course precludes continuation in the program. These requirements include the professional courses Supervised Clinical Education I and II. Students are expected to adhere to all terms of the department’s policy statement. For information on departmental academic policies and procedures, contact the Department of Physical Therapy.

Transfer Students Transfer students are admitted to the freshman and sophomore years of the physical therapy program based upon academic achievement and the availability of space in a particular graduating class. Consideration will be given to those transfer applicants who have achieved a minimum quality-point average of B (3.0).

■ **Accreditation**

The curriculum in physical therapy is accredited by the Commission on Accreditation in Physical Therapy Education of the American Physical Therapy Association.

■ **Course Requirements***

General

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Mathematics [†]	8	Lab: Physics for Life Sciences I [‡]	1
English [†]	8	Introduction to Human Anatomy	
General Chemistry [†]	10	and Physiology I, II, III [†] [‡]	12
Current Issues in Health [†]	4	Foundations of Psychology I [†]	4
First Aid [†]	2	6 General electives	24
Physics for Life Sciences I [‡]	4	Foundations of Psychology II [†]	4
Physics for Life Sciences II [‡]	4	Beginning Computer Use [†]	4

Professional

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Cooperative Education in PT [†]	1	Pediatric Evaluation/Treatment	2
Introduction to Physical Therapy I [†]	2	Neuroanatomy	5
Therapeutic Modalities in PT Practice [‡]	4	Pathophysiology and Clinical	
Developmental Basis of Human		Therapeutics	1
Performance	4	Clinical Integration	4
Clinical Gross Anatomy	6	Pediatric Neurology	2
Physiology for Physical Therapists	5	Research for Physical Therapy	4
Physical Therapy I	2	Psychosocial Aspects of Illness	3
Clinical Medicine I and II	7	Physical Therapy in the	
Clinical Kinesiology	4	Health Care System	3
Basic Evaluation Techniques	3	Advanced Musculoskeletal	
Musculoskeletal Therapeutic Exercise	5	Assessment and Treatment	3
Prosthetics	1	Functional Assessment of the	
Supervised Clinical Education I	5	Elderly Client	3
Neurological Therapeutic Exercise	4	Supervised Clinical Education II	0
Cardiopulmonary Rehabilitation in PT	4	Clinical Seminar	4
Middler-Year Writing Requirement	1	Administration	4
Neurological Assessment and			
Adult Neurology	3		

*Minimum graduation requirement —187 Q.H.
[†]These courses are usually taken in the freshman year.
[‡]These courses are usually taken in the sophomore year.

Note: Computer literacy must be demonstrated prior to entering the middler year. The Middler-Year Writing Requirement must be satisfied in conjunction with Psychosocial Aspects of Illness.

■ **Sample Freshman-Year Program**

First Quarter	Second Quarter	Third Quarter
Foundations of Psychology I	Introduction to Human	Introduction to Human
Fundamentals of Mathematics	Anatomy and Physiology I	Anatomy and Physiology II
General Chemistry I	General Chemistry II	Freshman English II
Current Issues in Health	Freshman English I	Beginning Computer Use
First Aid	Introduction to Physical	Functional and Basic Calculus
	Therapy 1	Cooperative Education in
		Physical Therapy

Note: In addition to the above courses, students may choose to take Basic ROTC.

Human Services

John D. Herzog, Ph.D., *Department of Education, Co-Director and Professor*
Wilfred E. Holton, Ph.D., *Department of Sociology/Anthropology, Co-Director and Associate Professor*

<i>Advisory Committee</i>	Lawrence Litwack, Ed.D.	Barbara A. Schram, Ed.D.
Diana S. Graham, Ph.D.	<i>Counseling Psychology,</i>	<i>Education</i>
<i>Health, Sport and</i>	<i>Rehabilitation, and</i>	Harold S. Zamansky, Ph.D.
<i>Leisure Studies</i>	<i>Special Education</i>	<i>Psychology</i>
John D. Herzog, Ph.D.	Richard A. Loverd, Ph.D.	<i>Fieldwork Supervisor</i>
<i>Education</i>	<i>Political Science</i>	Natalie H. Riffin, M.Ed., O.T.R.
Wilfred E. Holton, Ph.D.	Gordana Rabrenovic, Ph.D.	
Maureen E. Kelleher, Ph.D.	<i>Sociology/Anthropology</i>	
<i>Sociology/Anthropology</i>	David A. Rochefort, Ph.D.	
Louise La Fontaine, Ed.D.	<i>Political Science</i>	

Degree Offered: Bachelor of Science in Education, Bachelor of Arts (Arts and Sciences)

Human services is an interdisciplinary major involving the Boston-Bouv  College of Human Development Professions and the College of Arts and Sciences. It may lead to careers in the helping professions or to graduate specializations.

■ **Professional Preparation**

Students who major in human services prepare for jobs in public and private agencies. Graduates have found opportunities in such areas as administration, community organizing, counseling, serving deaf clients, working with delinquent youth as a court liaison, researching and evaluating social programs, doing case work in social service agencies, sheltered workshops, mental health settings, and staffing halfway houses, penal institutions, and drug treatment centers.

■ **The Major**

The Human Services Program offers an extensive advisory system to help students make the best use of course opportunities and to guide them in the choice of major specializations and in career planning.

■ **Graduation Requirements**

The overall requirements for each participating college differ in certain respects. Refer to page 45 for requirements in the College of Arts and Sciences. Boston-Bouv  students complete a five-year cooperative education program. The basic aspects of the program are as follows:

Prerequisite courses Prescribed courses in counseling, sociology, psychology, government, economics, and human services, for a total of six courses.

Core courses Nine courses in counseling, statistics, research methods, group process, organizations, personality, intervention strategies, and a senior seminar.

Social and community issues Three courses from a list of recommended options in the areas of African-American studies, special education, poverty, or social problems.

Specializations A five-course program developed in conjunction with an adviser in a subfield of human services. These specializations are usually in administrative, community, or clinical fields. Specializations have been developed in deaf studies, aging, administration, business, speech and hearing therapy.

Fieldwork Two 150-hour fieldwork placements during the last two years of the program. Students must apply for fieldwork assignments early in the quarter before the fieldwork will be done. Students have found placements in community programs, nursing homes, vocational workshops, state and federal agencies, and recreational facilities. Cooperative education experiences provide additional opportunities to put classroom knowledge and personal talents to work.

■ Related Activities

The Human Services Student Organization combines social and career-related activities. This group has organized open houses, bake sales, clothing drives, meals for the homeless, social activities, day-long conferences, and weekend retreats. Students and faculty publish the *Human Services Newsletter*.

Students also co-lead the Fenway Project, a campus office that recruits, places, and supports student volunteers in social, educational, and recreational agencies in Northeastern's neighborhood. Project volunteers have worked with senior citizens, school-age children, patients from a health clinic, and other groups. The year culminates in a community fair, the Fenfest, attended by students and neighborhood residents. The Fenway Project began in 1973 through the auspices of Boston-Bouvé College and has been administered by the Human Services Program since 1986.

■ Related Programs

See American Sign Language Programs, Business Minor, Elementary Spanish Course for Criminal Justice and Human Services Majors, International Programs, Irish Studies Program, Linguistics Minor, and Women's Studies Minor in the Special Programs section, which begins on page 79.

College of Business Administration



David P. Boyd, Ph.D., *Dean*

Roger M. Atherton, Jr., Ph.D., *Associate Dean*

Jay A. Halfond, Ph.D., *Associate Dean*

William I. Kelly, *Director (Graduate School of Professional Accounting)*

Dennis Ramsier, M.B.A., *Assistant Dean (Undergraduate Program)*

Joseph P. Zolner, M.P.P.M., *Director (Graduate School of Business)*

Accounting Group

Professors

Ronald M. Copeland, Ph.D.,

Lillian L. and

Harry A. Cowan Research

Professor of Accounting

Joseph R. Curran, Ph.D.

Paul A. Janell, Ph.D.,

Joseph M. Golemme

Professor of Accounting

Russell W. Olive, D.B.A.

Arnold Wright, Ph.D.

Associate Professors

Sharon M. McKinnon, Ph.D.

H. David Sherman, D.B.A.

Assistant Professors

James P. Angelini, Ph.D.

Janice DiPietro, D.B.A.

Bairj Donabedian, Ph.D.

Mario J. Maletta, Ph.D.

Thomas W. Oliver, Ph.D.

Robert G. Ruland, Ph.D.

John Schatzel, D.B.A.

Lecturers

Michael D. Cottrill, M.S., C.P.A.

Lynn W. Marples, M.B.A.

William Siddall, M.B.A.

Finance and Insurance Group*Professors*

Wesley W. Marple Jr., D.B.A.
Joseph W. Meador, Ph.D.
Jonathan B. Welch, Ph.D.

Associate Professors

Paul J. Bolster, Ph.D.
Jeffrey A. Born, Ph.D.
Donald G. Margotta, Ph.D.
Coleen C. Pantalone, Ph.D.

Harlan D. Platt, Ph.D.
Venkatesan Srinivasan, Ph.D.

Assistant Professors

Alan D. Alford, Ph.D.
Swaminathan Badrinath,
Ph.D.
Jay N. Ball, Ph.D.
Hugo J. Faria, Ph.D.
Steven D. Felgran, Ph.D.

Daryl E. J. Gurley, Ph.D.
Vahan Jangigian, Ph.D.
Yash P. Joshi, Ph.D.
Edward M. Saunders, Ph.D.
Emery A. Trahan, Ph.D.

Lecturers

Peggy L. Fletcher, M.B.A.
Bibi Zorina Khan, M.A.
Carolyn D. Schellhorn, M.B.A.

General Management Group*Professors*

Roger M. Atherton, Ph.D.
Charles D. Baker, M.B.A.
John Diffenbach, D.B.A.
Robert C. Lieb, D.B.A.
Daniel J. McCarthy, D.B.A.
Ravi Sarathy, Ph.D.
Seymour Tilles, D.B.A.
Heidi Vernon-Wortzel, Ph.D.

Associate Professors

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Raymond M. Kinnunen, D.B.A.
James F. Molloy, Jr., Ph.D.
Ravi Ramamurti, D.B.A.
Robert W. Stuart, Ph.D.

Assistant Professors

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Eugene M. Salorio, D.B.A.
Alvin G. Wint, Ph.D.

Lecturers

Stanley R. Berkowitz, J.D.
James S. Cook, A.B.
Mary F. Costello, J.D.
Robert Goldberg, M.B.A.
Ronald Thomas, D.B.A.

Human Resources Group*Professors*

David P. Boyd, Ph.D.
Richard B. Higgins, Ph.D.
Ralph Katz, Ph.D.

Associate Professors

Rae Andre, Ph.D.
Brendan D. Bannister, D.B.A.
Thomas M. Begley, Ph.D.

Cynthia Lee, Ph.D.

Edward F. McDonough III,
Ph.D.
Andre P. Priem, M.A.
Bert A. Spector, Ph.D.
Francis C. Spital, Ph.D.
Edward G. Wertheim, Ph.D.

Assistant Professors

Lucinda Doran, Ph.D.
Richard D. Jette, Ph.D.
Debra Mesch, Ph.D.
Sheila M. Puffer, Ph.D.
Kirsten Wever, Ph.D.

Lecturer

Jeffrey A. Mello, M.B.A.

Management Science Group*Professors*

Sangit Chatterjee, Ph.D.
Michael J. Maggard, Ph.D.
Robert A. Millen, Ph.D.

Associate Professors

R. Balachandra, Ph.D.
Allen G. Burgess, D.B.A.
Kathleen Foley Curley, D.B.A.
Victor B. Godin, D.B.A.
Carl W. Nelson, Ph.D.

Robert A. Parsons, M.B.A.
Majorie Platt, Ph.D.
Marius M. Solomon, Ph.D.
Eileen Trauth, Ph.D.
Mustafa R. Yilmaz, Ph.D.

Assistant Professors

Maylun Buck-Lew, Ph.D.
Maria-Cecilia Carrera, Ph.D.
Young H. Chun, Ph.D.
J. Stephanie Collins, Ph.D.

Allen G. Greenwood, Ph.D.
Pradeep K. Kedia, Ph.D.
Hokey Min, Ph.D.
Neville Nagarwalla, Ph.D.
Bharat C. Ruparel, D.B.A.

Lecturers

Richard Briotta, M.B.A.
Michael Zack, M.B.A.

Marketing Group*Professors*

Robert J. Minichiello, D.B.A.
Samuel Rabino, Ph.D.
Frederick Wiseman, Ph.D.

Associate Professors

Dan T. Dunn, D.B.A.
Robert F. Young, D.B.A.

Assistant Professors

Gloria Barczak, Ph.D.
Deirdre M. Bird, Ph.D.
Kristina Cannon-Bonventre,
Ph.D.
Dianne Cermak, Ph.D.
John Friar, Ph.D.

Lynn J. Jaffe, D.B.A.
Linda Jamieson, Ph.D.
Saul Klein, Ph.D.
Keith B. Murray, Ph.D.
Shubhro Sen, Ph.D.
Harlan E. Spotts, Ph.D.

Lecturer

Peter L. Nye, M.B.A.

Degree Offered: Bachelor of Science in Business Administration

The programs in the College of Business Administration are designed for students preparing for managerial responsibility. These programs seek to develop the ability to recognize and solve problems and to understand the role of the business firm in the community, the nation, and the world. Students have the opportunity not only to gain a broad understanding of business and organizational problems, but also to observe effective solutions at firsthand.

The college has adopted the following aims:

- to develop attitudes and ideals that are ethically sound and socially desirable;
- to cultivate an awareness of the social, political, and economic developments to which the business firm must adapt;
- to develop the habits of accurate thinking essential to sound judgment and accurate expression essential to effective communication;
- to provide an opportunity to develop a specialization in business in accordance with one's interests and talents.

■ Professional Preparation

The challenges that businesses face from unprecedented political change, the effects of foreign policy, high technology, affirmative-action regulations, and new economic policies enhance the demand for highly trained individuals equipped to analyze the complex social and legal problems of our economy.

Students find that graduate schools view a Bachelor of Science degree in Business Administration as solid preparation for graduate work in business as well as public administration, health-care administration, and education administration. Many careers in law also involve the business world. Law schools look favorably on the prelegal background obtained in business school. Although the Association of American Law Schools does not recommend particular courses for prelegal students, it does advise undergraduates to develop critical understanding of the institutions and values with which the law deals.

■ Five-Year Cooperative Education Program

The College of Business Administration offers concentrations in accounting, entrepreneurship and small business management, finance and insurance, human resources management, international business, management, management information systems, marketing, and logistics and transportation. The business curriculum combines with courses in the sciences, humanities, and social sciences to give students a well-rounded background.

In addition to their academic courses, all students are required to complete the Cooperative Plan of Education, which offers students the opportunity to challenge and reinforce in the workplace theories and techniques learned in the classroom. Cooperative education experiences generally are paid, full-time professional positions for six months of each year after the freshman year.

The final three years emphasize the functional areas of business and require students to concentrate in specific areas. (See pages 110–119.) In most upper division courses, the lecture-and-recitation format is supplemented by problem solving and case studies. Students are encouraged to think independently, to support ideas with fact and logic, and to analyze and challenge propositions. Special classrooms facilitate the case method of instruction.

■ Honors Program

See page 19. The college offers outstanding juniors and seniors the opportunity to participate in specially designed courses and an optional senior thesis project.

■ **Honor Societies**

Beta Alpha Psi (Accounting) and Beta Gamma Sigma—see page 203.

■ **Graduation Requirements**

Bachelor of science degree candidates must complete all prescribed work of the curriculum in which they seek to qualify, currently 176 quarter hours. The degree not only represents the formal completion of selected courses, but also indicates professional study in the area of concentration. A quality-point average of C (2.0) and a C average in all business courses are required for graduation. Students must be enrolled in a full program of studies in the College of Business Administration during the final three quarters preceding graduation.

■ **Graduation with Honors** See page 41.

■ **The Minor**

The minor provides a background that serves as a foundation for the study of business. Students explore the relationship between business and society and the obligations of each to the other.

Nonbusiness students may find the minor attractive if they are considering a career in business or pursuing an M.B.A. Qualified students who have completed the five background and methodology courses may apply for admission to the minor after they have accumulated 80 or more quarter hours of credit.

■ **Minor in Business Administration Program**

Background and Methodology*		Business Functions	
Course	Q.H.	Course	Q.H.
College Algebra	4	Introduction to Business	4
Macroeconomics	4	Accounting Principles I	4
Microeconomics	4	Organizational Behavior	4
Descriptive Statistics	4	Finance	4
Inferential Statistics	4	Introduction to Marketing	4
		Operations Management	4
Total Quarter Hours		Total Quarter Hours	24
Business and Its Environment			
Course	Q.H.		
One course from the approved list	4		
Total Quarter Hours	4		

*Completed prior to formal entry into the minor.

■ **Accreditation**

The undergraduate program of the College of Business Administration meets the American Assembly of Collegiate Schools of Business standards for faculty and student quality, curriculum design, and overall University support.

■ **Sample Freshman-Year Program**

The sample freshman-year program and the basic course requirements for the College of Business Administration are the same for all concentration areas. The College of Business Administration has no physical education requirement. Students may take up to eight quarter hours in physical education as open elective credits.

First Quarter	Second Quarter	Third Quarter
Introduction to Business	Calculus for Business	Freshman English II
Two nonbusiness electives	Freshman English I	Two nonbusiness electives
Economics (macro)	Two nonbusiness electives	Economics (micro)

■ **Course Requirements**

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
English*	8	Computer-based Information Systems	4
Calculus for Business	4	Quantitative Models in Business	4
Introduction to Business	4	Organizational Behavior	4
Accounting I and II	8	Complex Organizations	4
Economics (macro)	4	Operations Management	4
Economics (micro)	4	Managing Social Issues	4
Introduction to Finance I and II	8	Business Policy	4
Introduction to Marketing	4	Nonbusiness electives†	44
Statistics I and II	8	Open electives‡	28

*In addition, all students must complete the Upper Division Writing Requirement (normally taken by business students in the junior year).

†For international business majors, eight quarter hours of this total must be from the international list. For all other students, four quarter hours must be from the international list.

‡For accounting concentrators, 24 Q.H.

■ **Graduate Education** For information on graduate degrees, see page 182.

Accounting Concentration

Accounting is a fast-growing and critical area of business. An exacting field that requires people who enjoy dealing with facts and figures as well as with people, accounting requires accuracy and an ability to reason and to interpret business data.

■ **Professional Preparation**

The College of Business Administration offers a variety of financial accounting and managerial accounting courses. Preparation for an accounting career either in industry or in public accounting encompasses all phases of record keeping, internal and external reporting, financial planning, cost control, the design and installation of systems and procedures, the application of electronic and other modern business methods to these activities, and managerial decision making.

■ **Five-Year Cooperative Education Program**

During the first two years, accounting students have the opportunity to develop communication and analytical skills, to gain an understanding of the nature of accounting, and to survey business as a dynamic institution in an economic setting. Also important is consultation with a coordinator from the Department of Cooperative Education about future work assignments.

Subjects in the third year include courses in marketing, finance, operations, personnel, statistical analysis, and economic activity. In the third and subsequent years, students may take specialized courses in cost accounting, accounting theory, planning and control, auditing, and taxes.

In addition to the sample program and basic course requirements, students who concentrate in accounting are required to take the following courses.

Professional Requirements

<i>Course</i>	<i>Q.H.</i>
Intermediate Accounting I, II, and III	12
Cost Accounting	4
Accounting Systems	4
Auditing	4
Federal Income Taxes	4

Entrepreneurship and Small Business

Management Concentration

The concentration in entrepreneurship and small business management offers students an opportunity to develop the skills necessary for the effective management of small enterprises. A concentration in this field offers a thorough “start-to-finish” perspective and provides courses that deal with these key questions:

- What are the characteristics of people who start their own companies, and what does it take to start and build a new business?
- What are some key sources of business opportunities, and how does one assess the feasibility of a particular venture?
- What sources exist for raising seed capital, and how does one acquire it?
- What are the critical problems and opportunities in successfully managing a smaller company, and what are the appropriate managerial methods?
- What are the key issues in financing and managing an ongoing, growing venture, and how can these be applied to small businesses?

■ Professional Preparation

Students who choose this concentration have a wide variety of motivations and goals. Some have hopes of starting or acquiring their own businesses; others may join a family business. All share an entrepreneurial spirit, which in recent years many large corporations have begun to encourage. Some graduates pursue careers in sales management, banking, public accounting, management consulting, or other areas that involve them with owners and managers of new and small companies.

■ Five-Year Cooperative Education Program

Courses in this concentration offer the opportunity to learn to assess personal aptitude and potential for small business, to find and evaluate business opportunities, to secure adequate funding, and to organize and manage the various functional facets of the small business—manufacturing, marketing, finance, control, and personnel.

The freshman program and the basic course requirements for the College of Business Administration are the same for all the concentration areas. (See page 109.) The professional course requirements are as follows:

Requirements

<i>Course</i>	<i>Q.H.</i>
Management of Smaller Enterprises	4
Opportunity Analysis and Venture Capital	4
Small Business Finance	4
New Venture Creation	4
Small Business Institute Field Project	8

Finance and Insurance Concentration

The objective of the finance and insurance concentration is to train students for the financial management of businesses, nonprofit organizations, and governmental units. Preparation is twofold:

- to offer information about practices, theories, and concepts of fiscal management;
- to provide experience in analyzing situations that require financial decisions.

■ **Professional Preparation**

Almost every phase of economic activity involves aspects of financial management—cash or other funds and economic resources available to the individual, business, or any other economic unit.

The finance and insurance concentration can help prepare students for careers in one of the many areas of funds management: security analysis, estate planning, corporate finance and control, financial planning, security or insurance brokerage, underwriting, credit management, and banking.

Career possibilities exist in financial institutions that perform indispensable services for business and industry—banks, insurance companies, investment houses, credit concerns, financial service institutions, mortgage companies, and national and local real estate brokerage firms and appraisers. Career openings can be sought in all areas of business, industry, and government, wherever financial planning and operation are vital.

■ **Five-Year Cooperative Education Program**

The freshman-year program of studies and the basic course requirements for the College of Business Administration are the same for all areas of concentration. (See page 109.) In the middler year, students take Introduction to Finance I and II and beginning courses in other business fields. Following the introductory courses, the required courses are Financial Institutions and Markets, Managerial Finance, and Investment Management. Electives are available in six subfields: managerial finance, investment management, management of financial institutions, insurance, real estate, and personal financial planning.

Finance and insurance courses are open to all students in the College of Business Administration provided they have taken the prerequisite subjects. Instructors may waive prerequisite courses in special circumstances.

The professional course requirements in finance and insurance subfields are as follows:

Requirements

<i>Course</i>	<i>Q.H.</i>
Financial Institutions and Markets	4
Managerial Finance	4
Investment Management	4
Finance electives	12

Insurance and Risk Management Specialization Risk management is the process of identifying, measuring, evaluating, and treating important risks. Insurance is an important method of risk financing in all organizations, including the family unit. Some individuals may study one or a few courses in insurance and risk management to broaden their understanding in order to manage their personal affairs better or to familiarize themselves with this area as part of their general management preparation. Others may specialize in this area and seek careers in the risk management function in business as managers of corporate employee benefits programs; as managers, adjusters, or underwriters in life insurance companies, property and liability insurance companies, insurance brokerage firms, insurance agencies, and independent adjusting firms.

Investment and Management Analysis Specialization This specialization enables students to gain a general understanding, which may help them manage their own affairs. Those seeking professional careers in organizations where the investment function is paramount (i.e., industrial and utility corporations, real estate developments,

financial institutions, and many governmental agencies) will find this specialization of great assistance.

The specialization can benefit students who are interested in careers as investment managers or security analysts in stock exchanges, investment advisory firms, brokerage houses, underwriting, mutual funds, and other investment companies; insurance companies, commercial banks, savings and loan associations, trust companies, mutual savings associations; federal and state governmental agencies such as the SEC, FDIC, Treasury Department, IRS, and others having regulatory responsibilities over the securities markets and their participants.

Managerial Finance Specialization The finance function in contemporary business is twofold: to provide needed funds on terms that are the most favorable in view of current planning and to regulate the flow of funds to maximize the realization of objectives. The key concerns of financial management are the capital structure of the business and the optimal manner in which its assets should be held. With only minor differences, these same broad objectives apply to the finance function of nonprofit organizations, including those in the public sector (units of government).

Management of Financial Institutions Specialization The three major topics of consideration in this area of specialization are the institutional structure of the financial system and the relation between it and the surplus and deficit units of the whole economy; asset, liability, and capital management problems of financial intermediaries; and investment analysis and portfolio management policies appropriate to different financial intermediaries.

Personal Financial Planning Specialization Deregulation of the financial sector has caused the number and complexity of investment alternatives to increase, making personal financial management a growth specialization. Various financial institutions require individuals to evaluate the financial needs of the investor and to create a portfolio of direct and indirect investments. All individuals with financial assets need some knowledge of the personal financial management process to better meet their financial needs. Topics in this specialization include portfolio analysis, insurance, real estate, and personal financial management.

Individuals who specialize in this subfield may work as financial planners for such institutions as commercial banks, savings and loan associations, savings banks, life insurance companies, trust departments, and financial planning companies.

Real Estate Specialization This specialization exposes students to the criteria, objectives, and risks of investments in real estate. The uncertain economic environment of the last decade has made this specialization particularly attractive. Topics include legal and financial considerations, internal and external factors determining site use, macro- and microeconomic analysis, and federal income tax implications.

Specialization in this subfield prepares the student for opportunities in equity investment organizations, real estate marketing organizations, mortgage banking associations, and primary mortgage lending sources (life insurance companies, real estate investment trusts, commercial and mutual savings banks, pension funds, and trust departments).

Human Resources Management Concentration

Human resources management, which focuses on the effective utilization of people at work, is an extension of personnel and labor relations. In addition to the traditional areas of employee relations, recruitment, selection, compensation, and training, a human resources manager must be knowledgeable about staffing, equal employment opportunity laws and affirmative-action procedures, organizational development, career planning, job design and motivation, leadership, and communications. The ultimate goal of human resources managers is to provide their organizations with highly effective employees.

■ Professional Preparation

In recent years increased attention has been paid to the quality of the employee's work life and its relation to the efficient production of goods and services. At a time when financial resources and investment capital are becoming scarcer, many organizations are taking a closer look at the management of their people. In recognition of this concern, the College of Business Administration offers an undergraduate concentration in human resources management.

The effective management of human resources calls for a partnership among personnel administrators, labor relations negotiators, wage and salary analysts, and operating line managers in the various functional areas (marketing, finance, production) of a company. As the traditional role of personnel administration is expanded to include affirmative-action programs, job enrichment, and organizational development activities, career opportunities in labor relations and personnel administration are likely to expand.

Whether graduates start their careers as work-flow analysts in manufacturing, customer service assistants in marketing, field auditors in an accounting department, or hospital unit managers, they will be required to demonstrate skills in working with individuals and groups to achieve desired results.

■ Five-Year Cooperative Education Program

Human resources management is practiced not only by specialists in personnel and labor relations, but also by line managers and specialists in other business areas. The human resources management concentration exposes students to all major functions of personnel administration and labor relations.

The freshman program and basic course requirements for the College of Business Administration are the same for all concentrations. (See page 109.) The professional course requirements for human resources management students are as follows:

Requirements

<i>Course</i>	<i>Q.H.</i>
Introduction to Human Resources Management	4
Selection and Performance Appraisal	4
Contemporary Labor Issues	4
Reward and Compensation Systems	4
Human Resources Management electives	8

International Business Concentration

The recent growth of multinational firms, international trade, and regional international trading blocs has created a shortage of skilled managers who are equipped to analyze the complexities of international business.

Careers in international business are best pursued in companies that carry on service, trade, or manufacturing operations in foreign countries. More and more, multinational firms require that candidates for top management positions have prior experience in international operations. In addition, large banks and insurance companies want their managers to understand international business. Other types of organizations—government, trade associations, and transnational bodies—require international business knowledge. Foreign travel is frequently a part of the job.

■ Professional Preparation

The international business concentration fosters development of an understanding of problems involved in operating business enterprises across national boundaries and of the ability to analyze the operations of businesses in multinational environments. Students who choose the international business concentration can gain an understanding of the economic, political, and social constraints on international business and develop skills in analyzing the financial, marketing, and operational strategies of the multinational firm.

■ Five-Year Cooperative Education Program

The curriculum consists of course requirements in arts and sciences, business administration, and international business.

The international business concentration consists of six courses. Three are required: Introduction to International Business, International Financial Markets, and Seminar in International Business. There are also three electives, two from international business and one from business. In addition, two nonbusiness electives in the basic course requirements must be chosen from the international list. (See page 116.)

The international business concentration permits a dual focus. A student may concentrate in international business and use open electives to fulfill the requirement of a second concentration. The dual concentration benefits those seeking employment in traditional functional areas (production, marketing, finance) in an international setting. All College of Business Administration courses offered as part of the international business concentration are available to students in other concentrations during their middler, junior, and senior years.

Arts and sciences electives such as modern languages, political science, international economics, cultural anthropology, philosophy, religious studies, and history—all appropriate to the understanding of international relations—are highly recommended to complement this concentration.

The freshman program and the basic course requirements for the College of Business Administration are the same for all concentrations. (See page 109.)

Professional Requirements

<i>Course</i>	<i>Q.H.</i>
Introduction to International Business	4
International Financial Markets	4
Seminar in International Business	4
International Business electives	8
Business elective	4

■ **International Electives**

Business List*

Comparative International Management
Cultural Aspects of Business
Environmental Pressures and Corporations
Import and Export Management
International Finance
International Human Resources
Management
International Labor Relations
International Marketing
International Transportation
Managing People in International Settings

Nonbusiness List†

Africa Today
American Foreign Policy
Arab-Israeli Conflict
Business German, French, and Spanish
China's Foreign Relations
Communism in Eastern Europe
Communism and Revolution
Comparative Economics
Contemporary Japanese Society and Culture
Development Economics
Economic History of Less Developed Countries
Economics of World Energy
Euro-Communism

Europe Since 1921
European Economic Development
European Political Parties
Government and Politics in the Middle East
Government and Politics of China
Government and Politics of Japan
Government and Politics of Latin America
History of Modern Italy
International Economics
International Law
International Organization
Introduction to Foreign Governments
Introduction to International Relations
Introduction to the Third World
Modern African Civilization
Modern France
Modern Western Economic History
Peoples and Culture of China
The Politics—Policies of Developing Nations
Social Change and Economic Development
Soviet Foreign Policy
Soviet Government
Soviet Russia
Third World Political Relations
World Politics

*These courses are not offered every year. Students are advised to consult preregistration material.

†This is a representative listing; other liberal arts courses may be taken upon approval of the area coordinator for the international business concentration.

Logistics and Transportation Concentration

Logistics and transportation are integral parts of national and international distribution systems. They are determining factors in the availability and prices of goods and services in our economy.

■ **Professional Preparation**

In corporate distribution, transportation specialists operate within a complex organizational framework in which goods are stored and moved. Effective management of this distribution process involves understanding inventory control, warehousing, transportation options, and the interaction of these activities with other functional operations.

Growing concern over the economic and service conditions of the transportation industry has created careers with government agencies engaged in transportation policy development and administration. Other career possibilities exist with carriers such as airlines, railroads, and trucking companies, which actively recruit people familiar with the operational and regulatory aspects of their businesses.

■ **Five-Year Cooperative Education Program**

The concentration offers students a balanced background in logistics and transportation. Courses cover not only the viewpoint of the corporate shipper and carriers, but also that of public officials and consumer advocates. Courses have a strong contemporary orientation and promote frequent interaction with practitioners from business and government.

Course offerings in transportation and physical distribution management are sequential. Students who desire only introductory exposure may take one or several courses as part of a broader business background. An undergraduate concentration in the area consists of six courses (three required, three elective).

The freshman program and basic course requirements for the College of Business Administration are the same for all concentrations. (See page 109.) Professional course requirements for logistics and transportation students are as follows:

Requirements

<i>Course</i>	<i>Q.H.</i>
Domestic Transportation System	4
Corporate Transportation/Logistics	4
Seminar in Transportation and Distribution	4
Transportation electives	12

Management Concentration

Management involves men and women who enjoy working with numbers and people. It is the process of getting things done through people by using business skills.

■ **Professional Preparation**

For the student whose career interests lie in the broad area of administration, the management concentration offers the opportunity to prepare for a wide variety of administrative careers in business, in government, and in nonprofit institutions.

■ **Five-Year Cooperative Education Program**

Management students must have a basic understanding of all organization functions: accounting, marketing, finance, and operations. Courses in these subjects offer an overview, including the interrelation of these areas and the ways they can be used as management tools. A similar approach is used in courses in other areas. Faculty pay significant attention to “people problems” to stress the importance of developing an effective work force. Courses in the management concentration vary considerably in content, method of instruction, and objectives. This participatory approach helps prepare students for the demands of management in the business community.

The curriculum and teaching methods focus on the development of basic skills and knowledge appropriate to administration, rather than on specialized functional techniques. Although the case study method is used extensively, a variety of teaching methods is employed. The basic objectives of the concentration are to confront students with appropriate learning experiences, to help them increase their skills in and knowledge of basic disciplines underlying administrative practice, and to help them develop judgment and skills in organizational problem analysis and decision making.

The freshman program and basic course requirements for the College of Business Administration are the same for all concentrations. (See page 109.) Professional course requirements for management students are as follows:

Requirements

<i>Course</i>	<i>Q.H.</i>
Cost Accounting for Management	4
Management Information Systems	4
Marketing Management	4
Leadership	4
Legal Aspects of Business	4
Business Policy II	4

Management Information Systems Concentration

■ Professional Preparation

The growth in the application of information technology in organizations is one of the most remarkable features of the late twentieth century. No longer are computers placed behind glass walls. Hardware and software are found in all corners of organizations, and the proliferation shows no signs of slowing down. Familiarity with this technology is necessary for any position in an organization.

The Management Information Systems (MIS) concentration was created to teach tomorrow's managers how to use information technology to its fullest potential in performing their duties. Students who elect this concentration will most likely move into one of the functional areas of management, using their MIS skills to link that area with employers' information systems resources. Students interested in an MIS concentration are encouraged to consider working toward a second concentration in one of the functional areas of management. Many careers are possible in this rapidly expanding field.

■ Five-Year Cooperative Education Program

The proliferation of information systems technology may be viewed as two distinct tracks. The first builds on the historical development of large and powerful computers that carry out organization-wide tasks, such as database management. Often referred to as end-user computing, the second track deals with the direct linkage of decision makers and user-friendly computer facilities.

The MIS concentration provides a background in both of these tracks as well as in the integration of information technology with corporate strategy. The concentration is composed of six courses—two taken in each of the middler, junior, and senior years. The freshman-year program and basic course requirements for the College of Business Administration are the same for all concentrations. (See page 109.) Professional course requirements for MIS students are as follows:

Requirements

<i>Course</i>	<i>Q.H.</i>
End-User Computing	4
Business Programming I	4
Business Programming II	4
Systems Analysis and Design	4
Database Management Systems	4
Management Information Systems	4

Marketing Concentration

A business organization not only designs and manufactures products, but also markets and sells them to manufacturers, wholesalers, retailers, and consumers. The marketing concentration focuses on these processes.

All the business activities that direct the flow of goods and services from producer to consumer are classified as marketing concerns. The marketing process begins by determining the needs and wants of customers. Once these are established, the organization's first objective is to produce goods or services to satisfy a particular consumer. Essential in all types of business are product design, research, pricing, packaging, transportation, advertising, selling, and servicing. The overall responsibility for these functions rests with the marketing manager.

Without successful marketing, industrial and consumer products remain unsold. More and more companies are finding that today's pace and high levels of production require up-to-date marketing techniques to generate higher sales volumes.

■ **Professional Preparation**

Students of marketing can choose careers in the public and private sectors of the economy, product or service marketing, profit or not-for-profit organizations, as well as in a variety of support functions, such as market research, consulting, advising government regulators, advertising, and new product development.

As members of the management policy group, marketing executives take a broad view of all aspects of business management and policy. They also serve effectively as trained specialists in their own areas.

■ **Five-Year Cooperative Education Program**

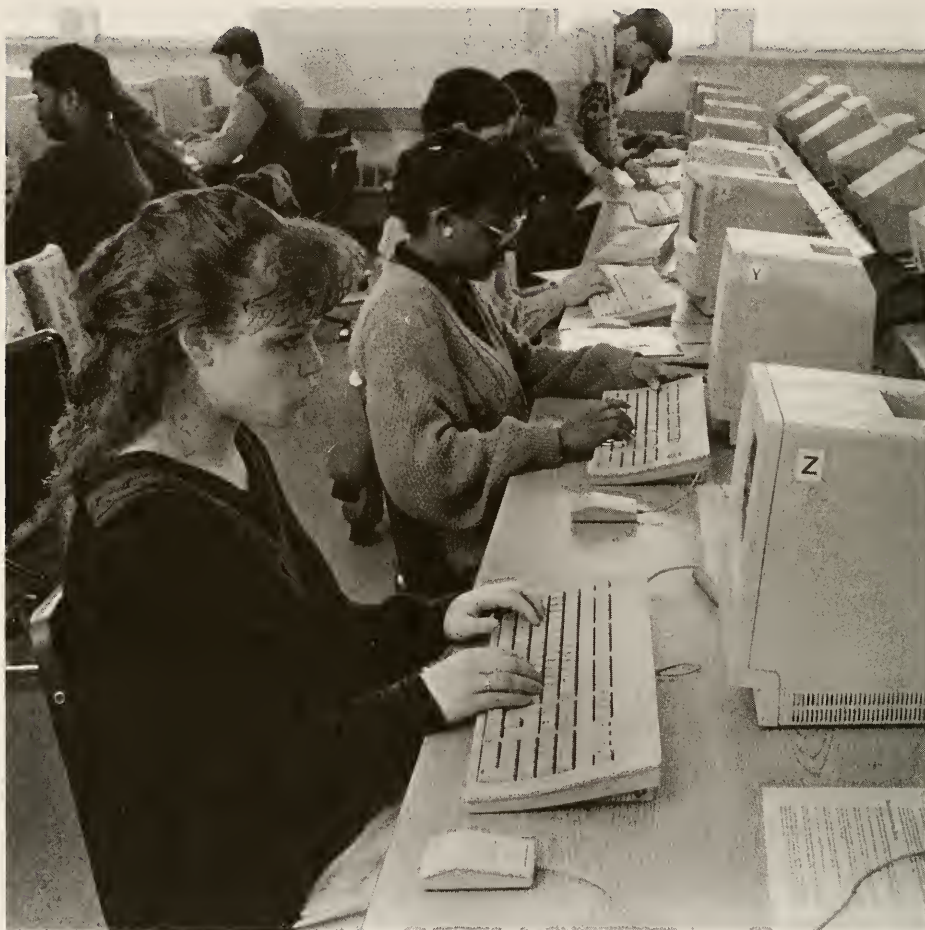
The marketing concentration offers a wide range of courses, taught by lecture, class analysis, case studies, project presentations, and class discussion. Included are such courses as Marketing Management, Advertising Management, Sales Management, Consumer Behavior, Competitive Strategy, and Marketing Research Management.

The freshman program and basic course requirements for the College of Business Administration are the same for all concentrations. (See page 109.) Professional course requirements for marketing students are as follows:

Requirements

<i>Course</i>	<i>Q.H.</i>
Marketing Management	4
Marketing Research	4
Competitive Strategy	4
Marketing electives	12

College of Computer Science



Cynthia A. Brown, Ph.D., *Dean*

Larry A. Finkelstein, Ph.D., *Associate Dean and Director of Graduate Studies*

Richard A. Rasala, Ph.D., *Director of Undergraduate Studies*

Marie P. Hinds, B.S., *Assistant to the Dean*

Professors

Harriet J. Fell, Ph.D.

Karl J. Lieberherr, Ph.D.

Richard A. Rasala, Ph.D.

Betty J. Salzberg, Ph.D.

Raoul N. Smith, Ph.D.

Mitchell Wand, Ph.D.

Patrick S. P. Wang, Ph.D.

Stuart Wecker, M.S.

Joint Professor

R. Mark Goresky, Ph.D.,
Mathematics

Associate Professors

Kenneth P. Baclawski, Ph.D.

Cynthia A. Brown, Ph.D.

John Casey, B.A.

Agnes H. Chan, Ph.D.

Gene D. Cooperman, Ph.D.

Robert P. Futrelle, Ph.D.

Carole D. Hafner, Ph.D.

Viera K. Proulx, Ph.D.

Ronald J. Williams, Ph.D.

Bryant W. York, Ph.D.

Assistant Professors

Khaled M. Bugrara, Ph.D.

John M. Gauch, Ph.D.

Richard A. Kelsey, Ph.D.

Luc Longpré, Ph.D.

Degrees Offered: Bachelor of Arts, Bachelor of Science in Computer Science

One of the fundamental goals of the college is to help students develop the ability to recognize and solve problems arising in the use of modern digital computers. Computer science is multifaceted. Spanning parts of pure and applied mathematics, it involves physics through solid state devices and pushes at the borders of biology and psychology in its attempts to understand and replicate intelligence.

In computer architectures and the complexity of VLSI design, computer science shares common ground with electrical engineering. Finally, through its database and information systems and computer graphics capabilities, computer science supports a wide variety of business and commercial ventures.

■ Professional Preparation

The College of Computer Science program is designed to prepare students for careers in industry, government, or the private sector. In general, graduates will help organizations design, develop, market, or utilize computing systems.

Some graduates become software designers, systems analysts, business or scientific applications programmers, marketers, or salespersons of technologically advanced products. Others become entrepreneurs and founders of their own firms.

Computer science may be broadly subdivided into four areas: applications, systems, theory, and technology.

Applications Applications focuses on the creation of software that makes computers useful and versatile. Instruction and research projects are devoted to the development of applications software. Expert systems, database systems, computer graphics, symbolic computation, computer-aided instruction, and numerical simulations are only a few of the applications.

Systems Systems centers on the design of large-scale programs that are the software core of a functioning computer—operating systems, programming languages, compilers, debuggers, and editors, among others. Other areas of investigation include artificial intelligence, networks, parallel processing, compiler design, and software engineering.

Theory Theory deals with the design and analysis of algorithms, the building and testing of large programs, the design of programming languages, and the development of tools to handle concurrent processes, parallel computation, and networks. Specific areas of investigation in theoretical computer science are algorithms for artificial intelligence systems, networks and parallel computation, cryptography, graph theory, and program verification.

Technology This area focuses on the identification of appropriate machine architecture for each of the interests discussed. The actual design of hardware is left to engineering departments and to industrial hardware designers.

Computer science students have the opportunity to assimilate ideas and concepts from theoretical studies; to engage in in-depth, hands-on programming of both large time-sharing systems and single-user microcomputers; and to develop professional insight gained from cooperative education.

Bachelor of Science in Computer Science Program

The Bachelor of Science emphasizes a sophisticated study of computer science and related areas of mathematics, physics, and electrical engineering. Students examine general principles and their implementation in database management systems, operating systems, and language processing systems. Students must acquire an in-depth understanding of one of these system areas.

Software design principles and practices are stressed through large projects. In addition, students have the opportunity to learn about the theoretical foundations of computer science and computer graphics, as well as artificial intelligence.

Students are encouraged to relate their work to the larger world. Required courses include writing, basic social sciences, the relationship of computers to society, and at least two additional electives in social sciences or humanities.

Students must also take a group of five related non-computer science courses (a block called a subarea), choosing from more than 30 subarea plans or creating a plan of their own. The subarea requirement guarantees that students will have some knowledge of the issues, problems, and methodologies of another discipline. Students interested in further work in their subarea may use general electives to expand the subarea into a minor concentration or to explore different fields.

■ Sample Freshman-Year Bachelor of Science Program

First Quarter	Second Quarter	Third Quarter
Calculus I	Algorithms and Data Structures I	Algorithms and Data Structures II
Computer Science Overview I	Calculus II	Calculus III
Freshman English I	Computer Science Overview II	FORTTRAN laboratory
Fundamentals of Computer Science	Discrete Mathematics I	Freshman English II
Basic Social Science I	Basic Social Science II	Subarea or General elective

■ Bachelor of Science Course Requirements

General			
Course	Q.H.	Course	Q.H.
Basic Social Science	8	Physics I, II, III	12
Calculus I, II, III, IV	16	Physics Laboratory I, II	2
Discrete Mathematics I, II	8	Probability	4
Freshman English I, II	8	Subarea/general electives	44
Linear Algebra	4		
Professional			
Course	Q.H.	Course	Q.H.
Algorithms and Data Structures I, II	8	File Structures	4
Analysis of Algorithms	4	FORTTRAN Laboratory	1
Analysis of Programming Languages	4	Functional Programming and Applications	4
Automata and Formal Languages	4	Fundamentals of Computer Science	4
C Laboratory	1	Senior Seminar	1
Computer Engineering	4	Software Design	4
Computer Organization and Programming I, II	8	Systems Programming	4
Computer Science Overview I, II	2	Technical Writing	4
Computers and Society	4	Computer Science electives	20
Digital Systems Laboratory	1		

Bachelor of Arts in Computer Science Program

The Bachelor of Arts program emphasizes computer science within the liberal arts tradition and has a science and mathematics base. Computer science requirements stress theoretical foundations and analysis of methods. Mathematics requirements support this approach. For natural science electives, degree candidates may choose from biology, chemistry, geology, and physics.

Choice and breadth of knowledge are highly valued. Degree requirements are modeled on the core curriculum of the College of Arts and Sciences. In addition to writing requirements, students must take a variety of courses in social sciences and humanities. Degree candidates must also achieve proficiency in a foreign language.

Requirements are flexible enough to allow students to combine the study of computer science with that of another discipline for a minor concentration. Those who wish to pursue interdisciplinary study involving several areas may also fashion an appropriate program with the help of a faculty adviser.

■ Sample Freshman-Year Bachelor of Arts Program

First Quarter	Second Quarter	Third Quarter
Calculus I	Algorithms and Data Structures I	Algorithms and Data Structures II
Computer Science Overview I	Calculus II	Calculus III
Freshman English I	Computer Science Overview II	FORTTRAN laboratory
Fundamentals of Computer Science	Discrete Mathematics I	Freshman English II
Core (1)	Core (2)	General elective

■ Bachelor of Arts Course Requirements

General

Course	Q.H.	Course	Q.H.
Calculus I, II, III	12	Middler-Year Writing Requirement	4
Discrete Mathematics I, II	8	Core courses	48
Freshman English I, II	8	General electives	32
Linear Algebra	4	Science electives	12

Professional

Course	Q.H.	Course	Q.H.
Algorithms and Data Structures I, II	8	Computer Science Overview I, II	2
Analysis of Algorithms	4	Computers and Society	4
Analysis of Programming Languages	4	Functional Programming and Applications	4
Automata and Formal Languages	4	Fundamentals of Computer Science	4
C Laboratory	1	Computer Science electives	16
Computer Organization and Programming	4	Senior Seminar	1

- **Honors Program** See page 19.
- **Honor Society** Phi Kappa Phi—see page 203.
- **Graduation with Honors** See page 41.
- **The Minor**

The College of Computer Science offers a minor to non-computer science students. This minor is particularly valuable to students seeking positions where a familiarity with computer science concepts and techniques is desirable. Four required level-one courses must be completed, plus three additional computer science courses elected from a number of courses specified by the college. Details may be obtained from the Dean's Office.

■ **Accreditation**

The college's Bachelor of Science in Computer Science Program has been accredited by the Computer Science Accreditation Commission of the Computing Sciences Accreditation Board, Inc. The board was established by the Association of Computing Machinery (ACM) and the Computer Society of the Institute of Electrical and Electronic Engineers (IEEE-CS), the two largest societies specializing in computing and related areas.

■ **Graduate Education** For information on graduate degrees, see page 182.

Five- and Four-Year Cooperative Education Programs

The undergraduate curricula of the Bachelor of Arts and the Bachelor of Science degree programs are administered in five-year and four-year cooperative education programs that incorporate alternating periods of classroom instruction and career-oriented work experience, extending from the second through the fifth year. A student in the five-year program normally spends eleven quarters in classes and seven quarters on co-op assignments, whereas a student in the four-year program spends eleven quarters in classes and four quarters on co-op assignments.

■ **Five-Year Schedule**

In these schedules, quarters with numbers mean quarters in school at Northeastern. Co-op and vacation quarters are so labeled.

Five-year students have a common freshman schedule. At the option of the student, the vacation may be used as an additional co-op quarter.

	Fall	Winter	Spring	Summer
<i>Freshman</i>	1	2	3	vacation

After the freshman year, students are divided into two divisions and follow one of the two schedules below:

	Fall	Winter	Spring	Summer
<i>Sophomore</i>	4	co-op	5	co-op
<i>Middler</i>	co-op	6	co-op	7
<i>Junior</i>	8	co-op	9	co-op
<i>Senior</i>	co-op	10	11	—

	Fall	Winter	Spring	Summer
<i>Sophomore</i>	co-op	4	co-op	5
<i>Middler</i>	6	co-op	7	co-op
<i>Junior</i>	co-op	8	co-op	9
<i>Senior</i>	10	co-op	11	—

■ **Four-Year Schedule**

In this schedule, quarters with numbers represent quarters in school at Northeastern. Co-op and vacation quarters are so indicated.

	Fall	Winter	Spring	Summer
<i>Freshman</i>	1	2	3	co-op
<i>Sophomore</i>	co-op	4	5	6
<i>Junior</i>	7	co-op	8	9
<i>Senior</i>	10	co-op	11	—

College of Criminal Justice



James A. Fox, Ph.D., *Interim Dean*
Robert D. Croatti, A.B., *Associate Dean*
Robert E. Fuller, M.A., *Assistant Dean*
Lester W. McCullough, Jr., B.A., *Assistant Dean*

<i>Professors</i>	<i>Associate Professors</i>	<i>Assistant Professors</i>
Edith E. Flynn, Ph.D.	John H. Laub, Ph.D.	Susan Guarino-Ghezzi, Ph.D.
George L. Kelling, Ph.D.	Wallace W. Sherwood, LL.M.	G. Roger Jarjoura, Ph.D.
Nicole F. Rafter, Ph.D.	Paul E. Tracy, Ph.D.	Frank A. Schubert, D.Jur.

Degree Offered: Bachelor of Science

The College of Criminal Justice helps prepare students for careers that are rewarding and beneficial. The college uses innovative methods and advanced scholarship to deal with some of the most important issues of our times.

As one of the few U.S. schools defining issues in criminal justice, the college has received substantial grants from the U.S. Department of Justice and has been designated a center of education and innovation in the field. In keeping with its national prominence, the college also serves as host institution for the George Lewis Ruffin Society, an organization of minority criminal justice professionals dedicated to expanding minority involvement and leadership in the criminal justice system through educational and outreach programs.

■ **Professional Preparation**

The college enables students to prepare for professional careers in the fields of criminal justice and private security. Through its legal studies concentration, many students also prepare for entry to law school. The curriculum offers students a broad academic foundation upon which to base professional courses that introduce specific career areas. Legal studies, law enforcement, private security, corrections, probation and parole, juvenile delinquency, and planning and evaluation are some of the areas of interest pursued by students. Some graduates choose advanced study in criminology, planning and evaluation, social work, public administration, private security, and law. The program is broad based and multi-disciplinary in order to prepare graduates to judge objectively the many problems inherent in the administration of justice in contemporary American society.

■ **Five-Year Cooperative Education Program**

The five-year academic program allows a candidate for the baccalaureate degree to undertake a specialized program of study in one of four concentrations: security and crime prevention, law enforcement, corrections, and legal studies. Co-op assignments may include work in parole or probation offices, law firms, police departments, private security agencies, public or private institutions, social and government agencies, prisons, planning and evaluation units, or other areas related to the criminal justice program.

Students are offered a broad and liberal educational background. Because students are preparing for careers involving the concerns and problems of people from all walks of life, coursework in the social sciences, behavioral sciences, and humanities is integrated with professional courses. The liberal content of the curriculum is not only a foundation for general intellectual development, but also an indispensable educational requirement for professional development. Professional course offerings address terrorism, organized crime, drug abuse, computer crime, industrial espionage, and prison overcrowding.

■ **Honors Program** See page 19.

■ **Honor Society** Alpha Phi Sigma—see page 203.

■ **Graduation Requirements**

Degree candidates must complete all prescribed work, a total of 172 quarter hours of credit. Students are also urged to meet the requirements of the Department of Cooperative Education.

■ **Graduation with Honors** See page 41.

■ **Transfer Credit**

No student transferring from another college or university is eligible to receive a degree until at least one year of academic work immediately preceding graduation has been completed at Northeastern.

■ **Sample Freshman-Year Program**

First Quarter	Second Quarter	Third Quarter
English History	Critical Issues in Criminal Justice	Administration of Criminal Justice
Introduction to Law and the Legal Process	English Foundations of Psychology I	Foundations of Psychology II
Introduction to Sociology	Psychology I	Introduction to American Government
	Introduction to Politics	History

Note: In addition to the above courses, students may choose to take Basic ROTC.

■ **Course Requirements**

General

Course	Q.H.	Course	Q.H.
Principles and Problems of Economics	8	Freshman English II*	4
Introduction to Politics*	4	State and Local Government [†]	4
Introduction to American Government*	4	History*	8
Foundations of Psychology I and II*	8	Science <i>or</i> Math [†]	8
Introduction to Sociology*	4	Middler-Year Writing Requirement	4
Freshman English I*	4	Non-Criminal Justice electives (12)	48

Professional

Course	Q.H.	Course	Q.H.
Administration of Criminal Justice*	4	Introduction to Criminal Law [†]	4
Critical Issues in Criminal Justice*	4	Criminal Due Process [†]	4
Introduction to Law and the Legal Process*	4	Criminal Justice Research	4
Criminology [†]	4	Criminal Justice electives (9)	36

*These courses are usually taken in the freshman year.

[†]These courses are usually taken in the sophomore year.

■ **Graduate Education** For information on graduate degrees, see page 182.

College of Engineering



Paul H. King, Ph.D., *Dean*

Richard J. Murphy, Ph.D., *Associate Dean for Undergraduate Programs*

David R. Freeman, Ph.D., *Associate Dean and Director of the Graduate School*

Thomas E. Hulbert, M.S., P.E., *Associate Dean and Director of the School of Engineering Technology*

Cynthia Snow, M.A., *Assistant Dean for Administration*

David C. Blackman, M.S., *Assistant Dean and Director of Minority Affairs*

Paula G. Leventman, Ph.D., *Assistant Dean and Director of Women in Engineering*

Candace A. Martel, M.Ed., *Director of Engineering Student Services*

The College of Engineering prepares students to contribute to the accumulation and application of technological knowledge in a changing world. Fundamentals are emphasized; students have the opportunity to obtain the basic technical knowledge necessary to practice in a variety of professional positions.

■ Professional Preparation

The college acknowledges and values study of the social sciences and humanities, for these provide an awareness of the social, economic, political, aesthetic, and philosophical influences that help shape the world in which students will practice their professions. The overall objectives of the College of Engineering are to help students to

- understand the basic principles of a particular branch of engineering;
- develop and demonstrate competence in analysis and design appropriate to an engineering specialization;
- communicate effectively and reason clearly;
- acquire the motivation to continue professional growth.

■ Five-Year Cooperative Education Program

Cooperative education programs are offered in chemical, civil, electrical, industrial, and mechanical engineering leading to the bachelor of science degree in a specified area. Also offered is a general engineering program leading to an unspecified bachelor of science degree. Through this program students may design a curriculum suited to their objectives. The various curricula offer students the opportunity to prepare effectively for employment in industry or for postgraduate study.

The freshman year comprises three quarters of full-time study. Courses in mathematics, physics, chemistry, and computers form the foundation upon which upperclass curricula are built. Beginning in the second year, students progress through sequential engineering science courses to advanced courses specific to their major. Advanced courses place a heavy emphasis on design. At least one-eighth of each curriculum is devoted to electives in the social sciences and humanities. All degrees require students to demonstrate proficiency in communication.

Cooperative work in one's chosen branch of engineering begins upon completion of the freshman year and continues throughout the upperclass years, alternating with periods of full-time study. Cooperative education experiences help the student integrate engineering and the liberal arts and are instrumental in teaching the value of teamwork. The student acquires valuable insight into the problems of engineering practice.

■ Four-Year Co-op Option

Most students complete the program in five years with seven quarters of cooperative work. Four-year co-op options are available with four quarters of cooperative work. Students indicate their preference for the four-year option in the winter quarter of the freshman year.

■ Honors Program See page 19.

■ Honor Societies

Alpha Pi Mu (Industrial Engineering and Information Systems), Chi Epsilon (civil), Eta Kappa Nu (electrical), Omega Chi Epsilon (chemical), Pi Tau Sigma (mechanical), and Tau Beta Pi (general)—see page 203.

■ Graduation Requirements

The college reserves the right to amend programs, courses, and degree requirements to fulfill its educational responsibility to respond to relevant change.

Degree candidates must complete all of the prescribed work of the curriculum in which they seek to qualify, with no academic deficiencies in required coursework.

Degree requirements are based upon the year of graduation, determined by the date of entry or re-entry into the College of Engineering. Degree requirements and the year of graduation for a degree candidate who fails to make normal academic progress for more than two quarters will be subject to review and possible change.

Students transferring from another college or university are not eligible to receive the bachelor of science degree until they have completed at least 48 quarter hours at Northeastern University immediately preceding their graduation.

- **Graduation with Honors** See page 41.

- **Bachelor of Science/Master of Science Joint Degree Program in Engineering**

The departments of Electrical and Computer Engineering, Industrial Engineering and Information Systems, and Mechanical Engineering offer programs leading to both the bachelor's and master's degrees in five years. Degree candidates must maintain a 3.2 cumulative quality-point average, carry extra courses, and forgo one cooperative work quarter in the senior year to complete the course requirements.

- **Part-Time Evening Program**

This program—a six-year, part-time curriculum—leads to a degree of Bachelor of Science in Civil, Electrical, or Mechanical Engineering. Admission and course requirements are the same as for the full-time five-year cooperative degree programs. For more information, consult the evening brochure of the College of Engineering, available from Engineering Student Services, 220 Snell Engineering Center, Northeastern University, Boston, MA 02115, 617-437-2185.

- **Transfer Credit**

Credit is generally granted toward a Northeastern degree for any reasonably equivalent course with a C (2.0) or better grade from another accredited institution. Students requesting transfer credit must provide supporting documentation such as transcripts and course descriptions.

- **Student Services**

Engineering Student Services Office The Engineering Student Services Office provides academic support services for all undergraduate students in the College of Engineering. The office, located in 220 Snell Engineering Center, is the primary source of assistance for all full-time and part-time candidates for the B.S. degree. All upperclass student files are maintained in this office.

Minorities in Engineering Through the Northeastern University Progress in Minorities in Engineering (NUPRIME) program, the college seeks to expand educational opportunities for qualified African-Americans, Puerto Ricans, Mexican-Americans, and Native Americans. It provides scholarships based on merit or need. Every effort is made to provide enough aid so that outside work is not necessary during the freshman year. Advising and tutorial services are among the support services provided by the program.

Women in Engineering More than 300 undergraduate women are enrolled in the college. The Women in Engineering Program office maintains a database for academic support and networking. An active chapter of the Society of Women Engineers offers a full schedule of technical, professional, and social programs.

- **Facilities**

Computers The college computer center supports coursework and research activities at all levels. Freshmen in the Engineering Graphics and Design course use 386 MS

DOS personal computers with color graphics and CADKEY software. Upperclass design courses in Electrical and Computer Engineering and Mechanical Engineering are served by DEC and SUN UNIX workstations for their VLSI and CAD/CAM applications. Student computer laboratories provide access to personal computers and Macintoshes that are connected by a high speed network to UNIX servers and a VAX cluster. Although ample resources are available for all student computing needs, many students choose to purchase their own computers.

■ **Accreditation**

All bachelor of science degree programs with specification, offered solely by the College of Engineering, are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (EAC/ABET). Part-time evening programs are also accredited.

■ **Sample Freshman-Year Program**

The freshman program in the College of Engineering is the same for all designated majors in the college.

First Quarter	Second Quarter	Third Quarter
Calculus	Calculus	Calculus
Computers for Engineers	Engineering Graphics	General Chemistry
English II	and Design	Great Themes in Literature
Physics	General Chemistry	Laboratory elective
Physics Laboratory	Physics	Physics
		Physics Laboratory

Note: In addition to the above courses, students may choose to take Basic ROTC.

■ **Graduate Education** For information on graduate degrees, see page 182.

Department of Chemical Engineering

Ralph A. Buonopane, Ph.D., *Associate Professor and Chairman*

Professors	Associate Professors	Assistant Professor
John A. Williams, Ph.D.	Bernard M. Goodwin, Sc.D.	Gilda A. Barabino, Ph.D.,
Donald L. Wise, Ph.D.,	Richard R. Stewart, Ph.D.	<i>DiPietro Professor of</i>
<i>Cabot Corporation</i>	Ronald J. Willey, Ph.D.	<i>Chemical Engineering</i>
<i>Professor of Chemical</i>		
<i>Engineering</i>		

Degree Offered: Bachelor of Science in Chemical Engineering

Chemical engineering involves the design, construction, operation, and management of processes in which materials essential to society are produced. The goal of the chemical engineer is to develop processes that use resources efficiently, economically, safely, and in an environmentally sound manner.

Since chemical engineering is so varied, the program has been designed to offer broad training which stresses fundamental principles and provides the strong background needed for acclimatization to graduate school or industry.

■ **Professional Preparation**

The chemical engineer has been defined as a “professional experienced in the design, construction, and operation of facilities in which materials undergo biological, chemical, and physical change.” Chemical engineers seek ways to reduce the

costs, increase the production, and improve the quality of existing products, as well as to develop new products. Chemical engineering has grown out of discoveries that served as a foundation for many new industries whose production processes involve chemical as well as physical changes.

Petrochemicals, biomedicine, pharmaceuticals, agricultural chemicals, food processing, plastics and synthetic fibers, energy and synthetic fuels, and waste management require employees trained in chemistry as well as engineering. Many older industries, such as pulp and paper, metals and glass production, paints and coatings, textiles, and electroplating, also employ chemical engineers. Computerized process controls are being designed to improve the efficiency of older plants, and computer-aided design of new plants is becoming increasingly common.

■ **Five-Year Cooperative Education Program**

The essential background for chemical engineers is derived from the fundamental courses in chemistry, mathematics, and physics required of all engineering students. Students go on to advanced courses that apply these fundamentals to the solution of engineering problems. These upperclass courses blend the latest mathematical and theoretical analyses with the practical aspects of the profession. Students are provided the opportunity to pursue specialized career interests.

■ **Four-Year Co-op Option** See page 129.

■ **Facilities**

Computers The Department of Chemical Engineering uses and maintains a wide variety of specialized proprietary software to complement coursework and research. Programs, including several complete simulation/design packages, are available for coursework from sophomore through senior years. A department computer facility for chemical engineering students maintains networked connections with the University VAX computers and with personal computers, printers, and plotters.

Laboratories The department has an undergraduate teaching laboratory with sophisticated real-world (pilot-scale) equipment that students operate to attain skills in experimental methods and communications necessary for professional practice. Department equipment is designed to introduce the student to basic measurements used in chemical engineering processes with emphasis on temperature, pressure, and flow rate. Students are given comprehensive problems to solve experimentally in such areas as heat and mass transfer, kinetics, thermodynamics, and process dynamics. They are required to design and conduct experiments, reduce data using computers, and write reports. Modern data acquisition techniques are used in all experiments; state-of-the-art process sensors transmit data signals to computers and microprocessors for analysis, read out, or control.

Some undergraduates are allowed to conduct research projects in department research laboratories currently devoted to modern catalytic materials, biotechnology, and computer process control.

■ **Course Requirements**

General

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
English	8	Engineering Graphics and Design	4
General Chemistry	8	Computers for Engineers	4
Chemistry Laboratory	1	Mathematical Analysis	4
Physics	12	Economics	4
Physics Laboratory	2	Social Science/Humanities electives	16
Calculus	20		

Professional

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Technical Writing	4	Heat Transport	4
Organic Chemistry	8	Separation Processes	4
Physical Chemistry	10	Chemical Engineering Economics	4
Chemical Engineering Calculations	8	Process Control	4
Computation Laboratory	2	Process Design	12
Chemical Engineering Thermodynamics	8	Chemical Engineering electives	12
Experimental Methods	8	Advanced Chemistry elective	4
Chemical Engineering Kinetics	4	Engineering elective	4
Momentum Transport	4		

■ **Technical Electives**

The Department of Chemical Engineering offers a variety of senior-year technical electives. These courses allow students to coordinate elective choices to satisfy their personal career objectives. Students must consult departmental guidelines to ensure satisfaction of design requirements.

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Kinetics of Polymer Processes	4	Biochemical Engineering	4
Mathematical Methods in Chemical Engineering	4	Catalysis	4
Mass Transfer Operations	4	Pollution Control in the Chemical Industries	4
Special Topics	4	Projects	6

Required advanced chemistry and engineering electives are selected from approved courses offered by other departments.

Department of Civil Engineering

Mishac K. Yegian, Ph.D., *Professor and Chairman*

<i>Professors</i>	<i>Associate Professors</i>	Daniel E. Medina, Ph.D.
Reginald L. Amory, Ph.D.	Peter G. Furth, Ph.D.	Walid S. Najjar, Ph.D.
Frederic C. Blanc, Ph.D.	Robert L. Meserve, M.S.	Ali Touran, Ph.D.
John J. Cochrane, Ph.D.	John G. Schoon, Ph.D.	Chia-Ming Uang, Ph.D.
Constantine J. Gregory, Ph.D.	Richard J. Scranton, M.S.	<i>Adjunct Professors</i>
Paul H. King, Ph.D.	Irvine W. Wei, Ph.D.	Walter E. Jaworski, Sc.D.
Kenneth M. Leet, Sc.D.	<i>Assistant Professors</i>	Sidney J. Wartel, J.D.
	Dionisio Bernal, Ph.D.	
	Mark Evans, Ph.D.	

Degree Offered: Bachelor of Science in Civil Engineering

The Department of Civil Engineering enables students to acquire a fundamental, yet rigorous and flexible, engineering education—an education that can weather inevitable changes within the field. A variety of electives in the humanities, social sciences,

and basic sciences encourages students to investigate areas outside their specific technical focus and to extend their personal interests and involvement.

■ **Professional Preparation**

Civil engineering is a profession in which knowledge of mathematics and physical sciences—gained by study, experience, and practice—is applied judiciously to materials and forces for the well-being of humanity. Civil engineers improve and protect the environment; provide facilities for community living, industry, and transportation; and provide structures for human use. The buildings people live and work in, transportation systems, city and town services, water supplies—all reflect the creative application of engineering principles by civil engineers.

Civil engineers measure and map the earth's surface and use these maps to situate their projects. They design and supervise the construction of bridges, tunnels, buildings, dams, and aqueducts. Civil engineers plan, design, construct, and maintain highways, railroads, canals, and airports. They regulate rivers and control floods; build docks, pipelines, seawalls; develop harbors; design and build plants and systems to bring pure water to homes and factories; design and build systems for sewage and refuse disposal; manage wetlands; and irrigate arid areas.

■ **Five-Year Cooperative Education Program**

The civil engineering curriculum is divided into academic quarters and cooperative work assignments. The work phase is designed to allow the student to gain insight into all types of activity normally confronted by the civil engineer. The well-motivated student can determine from these work experiences what further coursework will be required to become a successful practicing civil engineer.

The curriculum is intended to offer a solid educational background for students preparing for a career in the planning, design, and construction of foundations and structures, transportation systems, and environmental systems.

The first years of the curriculum are, for the most part, devoted to the fundamentals of mathematics, basic sciences, and engineering. The final years are devoted to a range of professional subjects, both required and elective. Guidance from a faculty adviser is available throughout the academic program.

■ **Four-Year Co-op Option** See page 129.

■ **Part-Time Evening Program** See page 130.

■ **Student Professional Society**

Northeastern University's student chapter of the American Society of Civil Engineers offers a unique complement to Northeastern's classroom and co-op experience. During the past ten years, in addition to traditional activities—sponsoring a weekly professional lecture series and field trips to construction sites and constructed facilities—members have successfully completed several community-service projects valued at approximately a quarter of a million dollars.

Among institutions to benefit from this chapter's financing, planning, design, and construction talents are the Children's Museum of Boston, the Joseph P. Kennedy, Jr., Memorial Hospital for Children, the Salvation Army's Camp Wonderland, the Coting School for the Handicapped, the Boston Children's Services Association, the Language and Cognitive Development Center, the Brookline Mental Health Clinic, and the Colonel Daniel Marr Boys and Girls Club of Dorchester.

In recognition of these efforts, our group has been designated the "single most outstanding" chapter in the nation and has received the Robert Ridgway Award of the American Society of Civil Engineers for an unprecedented nine years.

■ **Facilities**

Computers The Department of Civil Engineering complements coursework and research with a variety of computer facilities, including a microcomputer facility. All systems are supported with sophisticated software packages with applications to all disciplines of civil engineering.

Laboratories The department laboratories provide state-of-the-art equipment for research and teaching in soil mechanics, materials, structures, transportation, water quality, hydraulics, environmental chemistry, microbiology, and unit operations. There are special project laboratories and three controlled environment rooms. The laboratories contain sophisticated equipment, including atomic absorption spectrophotometers, a gas chromatograph, a total carbon analyzer, a shaker table, triaxial and consolidation equipment, and structural testing machines.

■ **Course Requirements**

General

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
English	8	Chemistry	8
Calculus	20	Economics	4
Computers for Engineers	4	Mathematical Analysis	4
Engineering Graphics and Design	4	Social Science/Humanities electives	16
Physics	16	General elective	4
Physics Laboratory	2	FORTTRAN Laboratory	1

Professional

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Technical Writing	4	Soil Mechanics (w/lab)	6
Structural Mechanics	8	Applied Probability Theory	4
Fluid Mechanics	4	Steel Design I	4
Engineering Economy	4	Dynamics	4
Structural Analysis (w/lab)	6	Materials (w/lab)	6
Environmental Engineering I	4	Concrete Design I	4
Capstone Design Project	4	Engineering Measurements (w/lab)	6
Computations Laboratory	1	Technical electives	28
Professional Ethics	1		

■ **Technical Electives**

The Department of Civil Engineering offers a variety of technical electives. These enable students to select courses to satisfy their career objectives.

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Thermodynamics	4	Legal Aspects of Civil Engineering	4
Hydraulic Engineering	4	Civil Engineering Systems	4
Structural Mechanics III	4	Transportation Analysis	4
Structural Analysis II and III	8	Construction Management	4
Concrete Design II	4	Steel Design II	4
Geotechnology	4	Foundation Engineering	4
Environmental Engineering II	4	Electrical Engineering	4
Environmental and Hydraulics Laboratory	4	Air Pollution	4
		Highway Engineering	4

Selected courses must include a combined total of 11 or more engineering design credits as specified by the department's design elective credit list.

Department of Electrical and Computer Engineering

John G. Proakis, Ph.D., *Professor and Chairman, William Lincoln Smith Chair*

Professors

Chung Chan, Ph.D.
Anthony J. Devaney, Ph.D.
James M. Feldman, Ph.D.
Arvin Grabel, Sc.D.
Jack I. Hanania, Ph.D.
Sheila Hinchey, Ph.D.
Sarma S. Mulukutla, Ph.D.
Harold R. Raemer, Ph.D.,
*George A. Snell Professor
of Engineering*
Wilfred Remillard, Ph.D.
J. Spencer Rochefort, M.S.
Sheldon S. Sandler, Ph.D.
Martin E. Schetzen, Sc.D.
Walter C. Schwab, Ph.D.
Philip E. Serafim, Sc.D.
Michael B. Silevitch, Ph.D.

Carmine Vittoria, Ph.D.

Associate Professors

Soeren Buus, Ph.D.
J. Duncan Glover, Ph.D.
Vinay Ingle, Ph.D.
Wayne G. Kellner, Sc.D.
Hanoeh Lev-Ari, Ph.D.
Stephen W. McKnight, Ph.D.
Robert N. Martin, M.S.
Lazaros Merakos, Ph.D.
Ramachandran Raghavan,
Ph.D.
Charles T. Retter, Ph.D.
Bahram Shafai, Sc.D.
Paul M. Zavracky, Ph.D.

Assistant Professors

David Brady, Ph.D.

Jill D. Crisman, Ph.D.

Edward W. Czeck, Ph.D.
Clas A. Jacobson, Ph.D.
Leonard E. Kay, Ph.D.
Anthony B. Maddox, Ph.D.
Elias S. Manolakos, Ph.D.
Nicol E. McGruer, Ph.D.
David J. McLaughlin, Ph.D.
Zainalabedin Navabi, Ph.D.
Carey M. Rappaport, Sc.D.
Masoud Salehi, Ph.D.
Charles Surya, Ph.D.
Gilead Tadmor, Ph.D.
Man-Kuan Vai, Ph.D.

Lecturers

William J. Bintz, M.S.
Glenn R. Hearn, M.S.E.E.

Degree Offered: Bachelor of Science in Electrical Engineering

Among their many achievements, electrical engineers have been primarily responsible for the development of the computer, integrated circuits, the pacemaker, satellite communication, space navigation, microprocessors, television, and the means of providing energy. Electrical engineers can help find solutions to the problems of information transfer and management, industrial productivity, energy conservation and alternative energy sources, transportation, and health care.

■ Professional Preparation

Diverse in its applications, electrical engineering can be divided into information sciences and energy resources. No rigid boundary exists between these two areas, and many technical specialties within electrical engineering apply to both. Information sciences are concerned primarily with systems whose function is computation, communication, or control. Included in this area are the circuits and devices that comprise such systems and the application of the systems and engineering techniques to other disciplines. The energy resources area deals with problems related to the sources, generation, and distribution of large quantities of electrical energy.

Many electrical engineers are involved with the traditional activities of system design and development, such as the information sciences or energy resources areas. Other electrical engineering graduates apply their skills to such disciplines as ocean exploration, meteorology, experimental psychology, electronic music, health-care systems, bioelectronics, and educational devices for the disadvantaged.

Electrical engineers have much to contribute to addressing many modern social problems: industrial productivity, the energy crisis, data transmittal and management, urban transportation, health care, and the plight of the socially and physically disadvantaged. The solution of all these problems requires judicious use of electrical energy, data processing, electronic instrumentation and control, and electronic communication.

■ **Option in Computer Engineering**

The option in computer engineering is for electrical engineering students who wish to specialize in the design of digital computers and their integration within larger systems for communications, resource management, and automatic control.

In the design of a digital processing system, hardware and software must be considered an integrated entity. The computer engineer must be both a capable programmer and a capable hardware designer. The collective demands of computer engineering and traditional electrical engineering encompass more knowledge than can be included in a single highly structured degree program. The undergraduate option of the Department of Electrical and Computer Engineering provides the student with a basic but comprehensive knowledge of the principles underlying the organization, design, and applications of digital processing systems. The option, therefore, encompasses both hardware and software design and promotes an understanding of the important relationships and trade-offs between the hardware and software components of digital systems. Such understanding is necessary to create computer systems that satisfy users' needs at affordable prices.

■ **Option in Power Systems Engineering**

The Power Systems Engineering Program is an option for electrical engineering students who wish to specialize in energy resources. This program is conducted in cooperation with electric power companies in New England and several eastern states.

■ **Five-Year Cooperative Education Program**

The program offers students an education that has the breadth and depth necessary for professional practice. To achieve this, the curriculum is divided into the core program and elective courses.

The core program includes courses with content applicable to all specialties in electrical engineering. Subject areas covered in the core program include circuits and systems, digital computer design, electrical measurements (laboratories), electromagnetics, electronic devices and circuits, and energy conversion.

Elective courses permit development of individual interests. Many students use this part of the program to learn a particular subject in depth and to prepare for graduate studies. A broad range of courses is offered, including Digital Computer Architecture, Software Engineering, Communication Systems, Control Systems, Advanced Electronics, Solid-State Devices, Power Systems, Wave Propagation and Distributed Circuits, VLSI Design, Digital Signal Processing, Integrated Circuit Fabrication, and Mathematical Techniques.

Students who wish to conduct individual projects or learn about a subject area not offered in an elective course may enroll in Senior Project and work one-on-one with an interested faculty adviser.

■ **Four-Year Co-op Option** See page 129.

■ **Bachelor of Science/Master of Science Joint Degree Program in Engineering** See page 130.

■ **Part-Time Evening Program** See page 130.

■ **Facilities**

Laboratory courses supplement concepts developed in core courses and introduce students to design and experimental techniques. Such courses are offered in circuits, electronics, electromagnetics, discrete systems, power systems, VLSI design, digital signal processing, control systems, and semiconductor device processing.

The department has laboratory equipment worth more than \$4.5 million. Facilities include standard and specialized laboratories, a PC laboratory, CRT terminals, and microprocessors. Programming courses and research programs also use the large computer systems of the College of Engineering and the University.

■ **Course Requirements**

General

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Calculus	16	Computers for Engineers	4
Physics	16	Engineering Graphics and Design	4
Physics Laboratory	2	Mathematical Analysis	4
General Chemistry	8	FORTTRAN Laboratory	1
English	8	Social Science/Humanities electives	20

Professional

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Technical Writing	4	Electronic Design I	4
Circuits and Systems I, II, and III	12	Field Theory I and II	8
Linear Systems Analysis I and II	8	Fields and Energy Conversion	4
Thermodynamics or Materials Science	4	Probability	4
Mechanics	4	Communication Systems	4
Electrical Engineering Laboratory	9	Computer Engineering	12
Electronics I and II	8	Technical electives	20

■ **Technical Electives**

The Department of Electrical and Computer Engineering offers a wide variety of technical electives designed to satisfy individual objectives. Students must consult departmental guidelines to ensure satisfaction of design requirements. These electives are grouped below by discipline.

Electronic Circuits and Systems

- Communication Theory
- Control Systems
- Electronic Design II
- Numerical Methods and Computer Applications
- Physical Electronics
- Power Electronics
- Semiconductor Devices and Technology
- Senior Project Laboratories
- Topics in Integrated Circuit Design

Electromagnetic Theory

- Advanced Topics in Electromagnetic Field Theory
- Numerical Methods and Computer Applications
- Optics of Photon Devices
- Semiconductor Devices and Technology
- Senior Project Laboratories
- Wave Transmission and Reception

Computer Engineering

- Applied Discrete Analysis
- Computer Engineering
- Control Systems
- Digital Signal Processing
- Electronic Design II
- Numerical Methods and Computer Applications
- Senior Project Laboratories
- Topics in Integrated Circuit Design

Systems Theory

- Control Systems
- Digital Signal Processing
- Numerical Methods and Computer Applications
- Power Systems I and II
- Senior Project Laboratories
- Wave Transmission and Reception

■ **Computer Engineering Option Course Requirements**

General Same as general requirements on page 138.

Professional

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Technical Writing	4	Computer Engineering I–IV	16
Circuits and Systems I, II, and III	12	Field Theory I and II	8
Linear Systems I and II	8	Fields and Energy Conversion	4
Electronics I and II	8	Communication Systems	4
Electronic Design I	4	Topics in Integrated Circuit Design	4
Thermodynamics or Materials Science	4	Probability	4
Mechanics	4	Technical electives	12
Electrical Engineering Laboratory	11		

■ **Power Systems Option Course Requirements**

General Same as general requirements on page 138.

Professional

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Technical Writing	4	Mechanics	4
Circuits and Systems I, II, and III	12	Electric Machines	4
Linear Systems I and II	8	Electric Power Systems	8
Thermodynamics	4	Electrical Engineering Power	
Electrical Engineering Laboratory	9	Laboratory	3
Electronics I and II	8	Electronic Design	4
Field Theory I and II	8	Computer Engineering	8
Fields and Energy Conversions	4	Probability	4
Power Electronics	4	Technical electives	8
Transients in Power Systems	4		

Department of Industrial Engineering and Information Systems

Stuart Jay Deutsch, Ph.D., *Professor and Chairman*

<i>Professors</i>	<i>Associate Professors</i>	<i>Assistant Professors</i>
Thomas P. Cullinane, Ph.D.	Nasser Fard, Ph.D.	M. Louis Brennan, Ph.D.
David R. Freeman, Ph.D.	Surendra M. Gupta, Ph.D.	Jason Kim, Ph.D.
Carolyn D. Heising, Ph.D.	Thomas E. Hulbert, M.S.	Anthony B. Maddox, Ph.D.
Ronald R. Mourant, Ph.D.	Mieczyslaw M. Kokar, Ph.D.	Mark Staknis, Ph.D.
Wilfred P. Rule, M.S.	Emanuel S. Melachrinoudis, Ph.D.	
	Ronald F. Perry, Ph.D.	
	Gerard Voland, Ph.D.	

Degree Offered: Bachelor of Science in Industrial Engineering

Industrial engineers are problem solvers. Industrial managers need factual information that defines the consequences of alternative decisions. The industrial engineer collects this information and evaluates alternatives to make decisions that best advance particular organizational goals. The scope of decisions may involve the entire organization or some portion of it associated with a given product or service.

■ **Professional Preparation**

As problem solvers, industrial engineers are concerned with complex human-machine systems that require a knowledge of engineering fundamentals. Since industrial engineers are often employed as managers, students are instructed in economics, statistics, operations research, and corporate organization. In addition, they learn the relationship between human needs and the work environment through courses in work analysis, human factors, and manufacturing systems.

■ **Five-Year Cooperative Education Program**

The program of study offered by the Department of Industrial Engineering and Information Systems emphasizes current developments in industrial engineering: computer/information and industrial/manufacturing systems. Computer-based applications are an integral part of most courses, including Probability and Statistics, Operations Research, Simulation, Engineering Economy, and Work Design. Students gain hands-on experience with microprocessors and automated manufacturing.

■ **Four-Year Co-op Option** See page 129.

■ **Bachelor of Science/Master of Science Joint Degree Program in Engineering** See page 130.

■ **Facilities**

Artificial Intelligence Laboratory This facility is equipped with Xerox artificial intelligence (AI) machines for programming expert systems and AI applications.

Computer Laboratory Numerous microcomputers allow students to apply software to engineering problems. The department has a large collection of industrial engineering software available for student use.

Human Factors Laboratory This lab allows students to engage in hands-on experimentation in task and skills analysis and to participate in learning perception and learning studies.

Manufacturing and Robotics Laboratory Students simulate an automated factory with the use of a master minicomputer, programmable microprocessors, a robot, and a conveyor belt integrated for manufacturing system experimentation.

Microprocessor Laboratory This laboratory has microprocessors for hands-on machine programming and microprocessor networking. Two local area networks of 16-bit microprocessors allow students to perform a variety of communication experiments.

Quality Assurance Laboratory The methods of quality control and reliability are studied with simulated experimentation and specialized computer and engineering software.

■ **Course Requirements**

General

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Calculus	20	Computers for Engineers	4
Physics	16	Economics I and II	8
Physics Laboratory	2	Mathematical Analysis	4
General Chemistry	8	Social Science/Humanities/Behavioral	
English	8	Science electives	16
Engineering Graphics and Design	4	Open elective	4

Professional

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Applied Engineering Software	1	Simulation	4
Technical Writing	4	People and Organizations	4
Work Design	4	Principles of Computation	
Statics	4	and Programming I	4
Electrical Engineering I	4	Engineering Economy and Statistical	
Probabilistic Analysis	4	Decision Theory	4
Statistics	4	Engineering Science electives	8
Quality Assurance	4	Technical electives	16
Production and Inventory Control	4	Design project	4
Operations Research I and II	8		

■ **Engineering Science Electives**

Dynamics I	Structural Analysis I
Fluid Mechanics	Systems
Materials Science	Thermodynamics I
Structural Mechanics II	

■ **Technical Electives**

The Department of Industrial Engineering and Information Systems offers a wide variety of technical electives. These enable students to coordinate elective choices to satisfy their personal objectives. Students must consult departmental guidelines to ensure satisfaction of design requirements.

Expert Systems in Engineering	Management Information Systems
Facilities Design	Manufacturing Automation
Human Considerations in Engineering Design	Materials Handling System Design
Human Factors	Microprocessor Applications

Department of Mechanical Engineering

John W. Cipolla, Jr., Ph.D., <i>Professor and Chairman</i>		
<i>Professors</i>	John Zotos, Met.Engr.	<i>Assistant Professors</i>
George G. Adams, Ph.D.	<i>Associate Professors</i>	Yiannis A. Levendis, Ph.D.
Charles A. Berg, Sc.D.	Charles W. Finn, Ph.D.	Andrew V. Tangborn, Ph.D.
John F. Dunn, Sc.D.	Gregory J. Kowalski, Ph.D.	Mary Grace Williams, Ph.D.
Alexander M. Gorlov, Ph.D.	Bertram S. Long, M.Engr.	<i>Professors Emeriti</i>
Richard J. Murphy, Ph.D.	Mohamad Metghalchi, Ph.D.	Ralph S. Blanchard, M.S.
Welville B. Nowak, Ph.D.,	Uichiro Narusawa, Ph.D.	Arthur R. Foster, M.Engr.
<i>Smith Professor of</i>	Hamid Nayeb-Hashemi, Ph.D.	
<i>Engineering</i>	Mohammad E. Taslim, Ph.D.	
John N. Rossettos, Ph.D.	Alvin J. Yorra, M.S.	
Yaman Yener, Ph.D.	Ibrahim Zeid, Ph.D.	

Degree Offered: Bachelor of Science in Mechanical Engineering

Mechanical engineering is concerned with energy: its transformation from one form to another, its transmission, and its utilization. Mechanical engineers conceive, plan, design, and direct the manufacture, distribution, and operation of myriad devices, machines, and systems—including complex human-machine systems—for energy conversion, environmental control, materials processing, transportation, materials handling, prosthetics, manufacturing, and consumer use.

■ **Professional Preparation**

The rapid technological advances of the past four decades have considerably expanded the mechanical engineer's sphere of inquiry and influence, bringing the engineer into contact with such diverse disciplines as nuclear and solid-state physics, quantum mechanics, plasma physics, chemical kinetics, magnetohydrodynamics, and rarefied gas dynamics.

Mechanical engineers are engaged in all the engineering functions, including creative design, applied research, development, production, and management. The field of mechanical engineering is broad, providing an excellent professional base for interdisciplinary activities and career choice.

■ **Five-Year Cooperative Education Program**

In the first years, students have the opportunity to learn essentials of the basic sciences (mathematics, physics, and chemistry), the engineering sciences (mechan-

ics, thermodynamics, fluid mechanics, and materials science), and the humanities. Senior students may choose to concentrate in the areas of thermofluids engineering, mechanics and design, or materials science and engineering.

Thermofluids engineering is concerned with the properties and characteristics of the working fluids of machines. For example, the ability of an aircraft to fly depends upon the manner in which air flows over its lifting surfaces. The energy to run a turbine is extracted from the steam or combustion gases that pass through it. The engineer must understand the concepts of thermodynamics. The efficiency of a cooling tower depends on the mechanisms by which fluids transfer heat to surfaces, so the engineer must have a firm grasp of the principles of heat transfer.

Mechanics and design are based on the fundamental scientific and mathematical tools used in the analysis of mechanical configurations as they evolve in the design of machines and power-producing devices. For example, the mechanics and design engineer may analyze and design structural components for power plants and deep-sea oceanographic vessels or develop new methods for evaluating filamentary composite structures. In the machine-tool industry, engineers may be concerned with computer control of machine tools. In the engine industry, they may analyze stresses in components such as turbine blades. Senior students may expand their basic knowledge by selecting such courses as Intermediate Strength of Materials, Systems Analysis and Control, and Computer-Aided Design.

Materials science and engineering are concerned with relationships among the structure, composition, properties, and functions of materials and with control of the structure and composition to achieve desired properties. Only recently have engineers come to realize that an understanding of the principles of materials science enables them to design more creatively and with greater freedom than does traditional reference to handbooks. Examples of areas in which the properties of materials are a part of the basic design function include manufacturing techniques, structures (vehicles, buildings), energy conversion, electronic devices (including computers), packaging, and prosthetic devices. Advanced courses are available for mechanical engineers desiring further knowledge in the materials field.

- **Four-Year Co-op Option** See page 129.
- **Bachelor of Science/Master of Science Joint Degree Program in Engineering** See page 130.
- **Part-Time Evening Program** See page 130.
- **Facilities**

Computers The department has a laboratory for computer-aided design (CAD) equipped with eleven SUN workstations, printers, and plotters. The CAD laboratory is supported by the engineering college computer center, which provides students and faculty access to an extensive library of mechanics codes and other related software for design. The department also has a computerized numerical control (CNC) milling machine for producing parts designed at the workstations.

Laboratories The extensive mechanical engineering laboratories fully support the teaching of the department as well as basic research in thermodynamics and fluid mechanics (thermofluids), mechanics of solids, and materials.

The thermofluids laboratories comprise an experimental internal combustion lab, a subsonic wind tunnel, a laser Doppler (dual-axis) velocimeter, and a variety of associated computer equipment and instrumentation for research in combustion, heat transfer, and turbulent flow. The laboratories support a program of solar energy research. Heat transfer research includes examination of interactions of coherent (laser) radiation with textile surfaces and studies of cooling of turbine blades.

The solid mechanics laboratories are equipped to support research in structural dynamics and vibrations and in the physical behavior of structural materials, including fracture, fatigue, and wear. These laboratories include two dynamic mechanical programmable shakers with accelerometers and other instrumentation. Equipment for research in the behavior of materials includes two Systems Corporation MTS programmable testing machines and several machines for experiments in tension, torsion, and fatigue loading.

The laboratory for materials research includes electron microscopes, thin-film laboratories, equipment for the preparation of metallurgical specimens, furnaces for processing experiments, and a powdered metal production plant. This laboratory supports experimental research in properties of films, microstructure of materials, and other studies related to engineering applications of materials. Other departmental resources include a fully equipped machine shop and a shop for electronics and instrumentation.

■ **Course Requirements**

General

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
English	8	Physics	12
General Chemistry	8	Physics Laboratory	2
Computers for Engineers	4	Mathematical Analysis	8
Engineering Graphics and Design	4	Physics/Science elective	4
Calculus	20	Social Science/Humanities electives	16
Key Ideas in Engineering	1	Economics	4

Professional

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Writing Workshop	1	Fluid Mechanics	5
Statics	5	Materials Science	5
Dynamics I and II	9	Design	20
Strength of Materials I and II	9	Electrical Engineering	4
Thermodynamics I, II, and III	15	Technical electives	16
Heat Transfer	5	Vibrations	5
Measurement and Analysis	5		

■ **Technical and Design Electives**

Four elective courses may be chosen from among the following courses. A course from outside the department may be substituted for one elective. Students must consult departmental guidelines to ensure satisfaction of design requirements.

Aspects of Forensic Design	Internal Combustion Engines
Computer-Aided Design I and II	Introduction to Combustion
Design for Space Applications	Materials Processing
Engineering Materials	Mechanical Behavior of Materials
Fluid Mechanics II	Mechanical Engineering Honors Projects
Gas Dynamics	Systems Analysis and Control
Intermediate Strength of Materials	

Program in Biomedical Engineering

Samuel Fine, S.M., M.D., *Professor and Director*

Degree Offered: Bachelor of Science (in one of the engineering disciplines)

Biomedical engineering addresses problems of biological and medical significance as tasks to be resolved through analysis, design, invention, and manufacturing.

■ Professional Preparation

Biomedical engineers are engaged in both theoretical and experimental studies, either as independent investigators or as members of a research or development group. Their work is far-ranging. They may characterize and determine the mechanism of action of natural and synthetic macromolecules, analyze the properties of blood, and/or investigate the structure and function of such organ systems as the nervous system, the respiratory system, the cardiovascular system, or the endocrine system. They may design, develop, market, and apply transducers, cardiac pacemakers and defibrillators, heart-assist systems, artificial kidneys and limbs, or diagnostic and therapeutic X-ray and imaging systems. They are important members of the hospital health team.

A strong program incorporating engineering and the biological sciences can provide a sound foundation for a doctorate in medicine or dentistry, a career in biomedical engineering or biotechnology, or a career as an engineer in a hospital or a government agency such as the U.S. Department of Health and Human Services. Opportunities in these rapidly expanding fields depend upon such factors as the state of the economy and the student's own industry and ability.

Industrial organizations, particularly those in the health-care industry, may be seeking individuals with a strong background in engineering supplemented by a biological science education. Other career opportunities may include public health, the psychological sciences, and the marine sciences.

■ Five-Year Cooperative Education Program

The purpose of the program is to help undergraduate students choose courses in the biological sciences that complement the standard engineering curriculum. There is, therefore, no special curriculum in biomedical engineering. Several engineering disciplines help provide the degree candidate with a technical background sufficient for a career in this field.

A degree in an engineering discipline is chosen in consultation with the biomedical engineering adviser. A biology minor in conjunction with the specific engineering discipline may also be arranged. Life science courses may be taken as part of an engineering degree or as additional courses. In the first year, engineering graphics and design can be replaced by a biology course for biomedical students. The opportunity to take these courses is dependent on the student's interests, capabilities, and academic record.

Students who wish to take an engineering program that includes biological sciences must contact the director of biomedical engineering immediately on arrival at the University so that a proper freshman-year schedule can be arranged.

■ Four-Year Co-op Option See page 129.

General Engineering Program

Advisory Committee for 1991–1992

Richard R. Stewart, Ph.D., *Chemical Engineering, Chairman*
Arvin Grabel, Sc.D., *Electrical Engineering*
Ronald F. Perry, Ph.D., *Industrial Engineering*
Richard J. Scranton, M.S., *Civil Engineering*
Alvin Yorra, M.S., *Mechanical Engineering*

Degree Offered: Bachelor of Science

Engineering and technology have a profound effect on the lifestyle and institutions of society. Their impact is both cultural and scientific and is manifested by the awareness that solutions to society's problems are, in part, technological. The program's goal is to provide flexible, interdisciplinary opportunities based on fundamental engineering concepts. The work performed by graduates of this program is expected to encompass the entire spectrum of professional activity— computers, urban technology, social systems, and health care.

■ **Professional Preparation**

Students completing an adviser-approved program receive an unspecified bachelor of science degree from the College of Engineering. Designed for students interested in engineering-related professions rather than traditional engineering, the program is highly elective and enables students to tailor a program that meets their particular objectives. Students are exposed to engineering fundamentals through courses in electric circuits, systems, mechanics, thermodynamics, and materials. These courses are based on principles developed in early courses in mathematics and physics. Each student is required to learn the elements of computer programming.

Graduate and continuing education are important in professional life. Appropriate planning enhances one's chance for admission to graduate schools, including law, medicine, public health, and social sciences as well as engineering.

■ **Five-Year Cooperative Education Program**

Students in the program are required to satisfy the following minimum requirements.

■ **Course Requirements**

General

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Calculus	20	Humanities electives	8
Computers for Engineers	4	Physics	12
Engineering Graphics and Design	4	Physics Laboratory	2
English	8	Social Science/Humanities electives	16

Professional

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Circuit Theory	4	Systems Analysis	4
Materials	4	Thermodynamics	4

The remainder of the program is elective but must fit the student's career objectives. At least 24 quarter hours of coursework must be taken in the professional departments of the College of Engineering (chemical, civil, electrical and computer, industrial and information systems, and mechanical engineering). Upperclass students plan their programs in conjunction with a faculty adviser.

■ **Four-Year Co-op Option** See page 129.

School of Engineering Technology



Thomas E. Hulbert, M.S., P.E., *Director and Associate Dean of Engineering*
Roy Dalsheim, B.S., *Assistant Director*
Rasma Galins, *Assistant Director*
Rosanne L. Bogan, B.S., *Staff Assistant*

Professor

Thomas E. Phalen, M.S., P.E.,
*Mechanical Engineering
Technology*

Associate Professors

David S. Goldman, M.S., P.E.,
Computer Technology
Eric W. Hansberry, M.S.,
Design Graphics

George F. Kent, M.S., P.E.,
*Mechanical Engineering
Technology (Visiting)*
Nonna K. Lehmkuhl, M.Ed., M.S.,
Computer Technology

Assistant Professors

David Allen, M.S.
John E. Hajjar, Ph.D.,
Computer Technology
Frederick J. Nohmer, Ed.D.,
*Electrical Engineering
Technology*

Lecturers

Robert B. Angus, M.S., P.E.,
*Electrical Engineering
Technology*
John Kaczorowski, M.S.
*Electrical Engineering
Technology*

Engineering technologists work with professional engineers, scientists, medical doctors, supervisors, and craftsmen to develop techniques for converting scientific knowledge and craftsmanship into products. Programs in the School of Engineering Technology concentrate on the applications of technology. The rational processes involved in converting theories and ideas into practical techniques, procedures, and products are emphasized. Fundamentals are related to current practice, providing a supportive “why” for the practical “how.” Study of the humanities and social sciences helps students gain a balanced awareness of the real world.

■ **Professional Preparation**

The engineering technology curriculum is based on the need for relevant technical skills and a foundation for future growth. Engineering technology education seeks to help students

- understand the scientific principles that govern the current technology of the particular branch of engineering that they select;
- apply technology to problem solving;
- communicate effectively the important implications of technological advances;
- acquire the motivation for continued development of technical skills.

■ **Five-Year Cooperative Education Programs**

The school offers cooperative education programs in mechanical engineering technology, electrical engineering technology, and computer technology—all leading to the degree of Bachelor of Science in Engineering Technology.

Since the freshman year of study is similar for electrical and mechanical engineering technology students, a firm choice of major may be delayed until the spring, when the choice of cooperative work assignments makes a decision mandatory. Students planning to major in computer technology should declare this major during the first quarter of their freshman year.

About 80 percent of the upperclass program is devoted to scientific and technological study and about 20 percent to humanities-social science courses, to balance technical proficiency with an appreciation of the nontechnical aspects of society and culture. Cooperative education experiences help students to integrate the elements of both a technical and a liberal education.

■ **Honors Program** See page 19.

■ **Honor Society** Tau Alpha Pi—see page 203.

■ **Graduation Requirements**

Candidates for the Bachelor of Science in Engineering Technology degree must complete all the prescribed work of the curriculum in which they seek to qualify. Students who undertake the cooperative education program must meet the requirements of the Department of Cooperative Education.

Students transferring from another college or university are not eligible to receive the degree until they have completed at least one academic year at Northeastern immediately preceding their graduation. For more information on transferring, see the Transfer Students section, page 14.

■ **Graduation with Honors** See page 41.

■ **Transfer Aerospace Co-op Program**

For transfer students, the school offers a three-year Bachelor of Science in Engineering Technology degree program with a major in aerospace maintenance

engineering technology. This program, in conjunction with East Coast Aero Technical School, is designed for students who have successfully completed a program in aircraft and power plant mechanics or similar technician programs.

To enter the program, students must pass College Algebra, Pre-Calculus, Calculus I, and Chemistry. During their three years of study, students participate in the cooperative education system.

Graduates of this program are prepared to pursue careers in the aircraft industry's technical, support, and management positions. They may also become members of engineering teams in spacecraft or aircraft component manufacturing. Other graduates of the program may assume design/applications positions in both civilian and military aerospace markets.

The aerospace maintenance engineering technology program comprises Calculus II and III, English, Principles of Economics, Physics I, II, and III, Physics Laboratory I, II, and III, Engineering Graphics I, Computer Programming, social science/humanities electives, Mechanics A and B, Stress Analysis A, Materials A and B, Electricity and Electronics I, Thermodynamics A, Fluid Mechanics A, Technology Laboratory A or C, technical electives, an open elective, and Stress Analysis B or Thermodynamics B.

■ **Part-Time Evening and Weekend Programs**

The School of Engineering Technology offers interdisciplinary programs providing technological and professional development opportunities. These programs provide educational opportunities for students who must pursue full-time employment but who desire to initiate or continue their academic work.

The part-time program includes courses and degree programs leading to the Associate in Engineering (A.E.), the Associate in Science (A.S.), and the Bachelor of Science in Engineering Technology (B.S.E.T.). The A.E. degree may be earned in computer technology and in architectural, environmental, structural, survey and highway, electrical, and mechanical engineering technology. The A.S. degree may be earned in telecommunications and energy systems.

Students seeking further education may earn the B.S.E.T. in computer technology, mechanical, electrical, mechanical-structural, or manufacturing engineering technology. A degree in aerospace maintenance engineering technology is available for transfer students who have completed an airframe and power plant curriculum.

For a copy of the current School of Engineering Technology bulletin or more information, contact Northeastern University, School of Engineering Technology, 120 Snell Engineering Center, Boston, MA 02115; or call 617-437-2500 (voice), 617-437-8526 (TTY), or 617-437-2501 (FAX).

■ **Accreditation**

The electrical and mechanical engineering technology baccalaureate day programs and the part-time baccalaureate programs in mechanical, mechanical-structural, and electrical engineering technology are accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (TAC/ABET). The Associate in Engineering degrees with majors in electrical and mechanical engineering technology are also accredited by TAC/ABET.

■ **Facilities**

Computers The University and college provide major computer resources. Departments also make available dedicated computer systems. Several types of computers are available in the computer technology laboratories, including a mainframe and a

variety of personal computers. Certain software courses use the microcomputer laboratories. Fifty personal computers in a local area network support freshman computer graphics and design courses.

Other facilities accessible to engineering technology students include a Digital Equipment Corporation (DEC) VAX 8650 with hard-wired terminals and extensive phone access, and a DEC VAX 11/785 supporting 32 terminals. The computer center provides access to a VAX 8650 and 170 PCs for general use.

Computer facilities available to the mechanical engineering technology student include various microcomputers for in-laboratory analysis on the SUN system, which uses UNIX.

Laboratories Laboratories are an integral part of the electrical and mechanical engineering technology curricula. Electrical laboratory courses include topics in circuits, electronics, computers, measurements, controls, microwaves, and power systems. Facilities run from integrated electronic devices to precision microwave equipment, and from simple electromechanical devices to power equipment.

A variety of microcomputers, including IBM PCs and Apples, are available to students for laboratory experimentation, data reduction, and computation. In the laboratory, VAX terminals are available for direct access to the University's mainframe computer.

The mechanical engineering technology laboratories contain equipment ranging from an electron microscope and ultrasonic measuring devices to pumps and weirs. Students working on thermofluids projects may use a turbine and various types of engines. A materials science laboratory is equipped with research microscopes, various furnaces, a fluid-to-fluid extrusion press, X-ray diffraction equipment, an electron microscope, and other related instruments. Facilities are provided for the mechanics and design areas, vibrations, experimental stress analysis, and materials testing.

■ Student Services

Office of Engineering Technology Student Services The Office of Engineering Technology Student Services is located in 120 Snell Engineering Center. The office serves as the primary source of assistance for students in the School of Engineering Technology. The office handles transfer-of-credit petitions and assists students having problems related to study skills, academic difficulties, and choice of major or career. It also houses the records of upperclass engineering technology students. (Freshmen records are kept by the Office of Freshman Affairs, which also handles freshmen transfer credit petitions and other matters involving records.) Freshmen are, however, welcomed by the office and encouraged to take advantage of its services and programs.

Minorities in Engineering Through the Northeastern University Progress in Minorities in Engineering Program (NUPRIME), the college seeks to expand educational opportunities for qualified African-Americans, Puerto Ricans, Mexican-Americans, and Native Americans. Advising and tutorial services are among the support services NUPRIME offers.

Women in Engineering Technology Increasing numbers of women are entering engineering technology programs each year. Approximately 12 percent of the entering class is female, and opportunities for cooperative work assignments and upon graduation are numerous. Women with mathematical and scientific aptitude and an interest in technical work are encouraged to consider the variety of engineering technology programs offered at Northeastern.

■ **Sample Freshman-Year Program**

The freshman-year program of studies in the School of Engineering Technology is similar for all majors.

First Quarter	Second Quarter	Third Quarter
College Algebra	Pre-Calculus	Calculus I
Physics I	Physics II	Physics III
English/Writing	English/Literature	Physics Laboratory III
Engineering Design Graphics I	Computer Programming for Engineering Technology*	Engineering Design Graphics II*
Physics Laboratory I	Physics Laboratory II	Speech Communications

*Computer technology students take Introduction to Programming and Basic Computer Organization instead of Computer Programming for Engineering Technology and Engineering Design Graphics II.
Note: In addition to the above courses, students may choose to take Basic ROTC.

Computer Technology Program

Nonna K. Lehmkuhl, M.Ed., M.S., *Coordinator for Computer Technology*

Degree Offered: Bachelor of Science in Engineering Technology

Computer technology deals with the design and application of equipment and systems related to computer hardware and software. Its major functions include:

- interfacing the computer with process plants or machinery;
- programming the computer for engineering, scientific, and business applications;
- designing, engineering, and testing computers;
- interfacing computers with various types of equipment for automatic drafting, data collection, design, and display.

■ **Professional Preparation**

The computer technology program provides degree candidates with both academic and technical learning experiences. These experiences are based on the core curriculum, which supports the present-day hardware and software systems industry. Students also choose technical electives in their area of interest. Theory courses are offered at the upper end of the technology spectrum. These high-level theory courses provide the means for students to continue their educational and professional development beyond the baccalaureate level. Some students pursue the Master of Technology degree or the more theoretical Bachelor of Science degree.

The computer technology program is designed to meet some of the personnel needs of the computer industry. Graduates of this program may become an integral part of the engineering support team that develops techniques to implement an engineering design project. As members of a research and production team, they work closely with engineers.

■ **Five-Year Cooperative Education Program**

Because of the interdependence of high-speed computers and electrical and electronic technology, this program includes courses in both circuit analysis and electronics along with basic courses in mathematics and physics.

The freshman year of the computer technology major is similar to that of the electrical and mechanical engineering technology majors, except that Introduction to Programming and Basic Computer Organization are taken in place of Computer Programming for Engineering Technology and Engineering Design Graphics II.

An introduction to computer programming and the study of basic computer organization gives freshmen early contact with the major field of study. To encourage self-expression, the freshman year includes literature and engineering graphics.

Upperclass students balance hardware and software courses, developing skills in various hardware systems from the micro to the mainframe and moving from languages to the design of software, such as an operating system. A laboratory provides upperclass students with hands-on experience in both areas. In each area, course content is updated continually to keep pace with an ever-changing technology. Students may specialize in either hardware or software or continue with both.

■ **Course Requirements**

General

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
College Algebra*	4	Physics I, II, and III*	12
Pre-Calculus*	4	Physics Laboratory I, II, and III*	3
Calculus I*	4	Engineering Graphics I*	4
Calculus II and III	8	Introduction to Programming*	4
English*	8	Basic Computer Organization*	4
Principles of Economics†	4	Social Science/Humanities electives	16
Speech Communications	4		

Professional

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Circuit Analysis I and II	8	Advanced Computer Organization	4
FORTRAN	4	CPU Hardware Architecture	4
Semiconductor Logic	4	Non-numerical Algorithms	4
Electronics I	4	Microperipheral Hardware	4
Modern Programming Techniques	4	Numerical Algorithms	4
Computer Logic	4	Data Communications Methods	4
C Language	4	Industrial Software	4
Assembly Language	4	Industrial Hardware	4
Introduction to CPU Hardware	4	Computer Peripheral Hardware	4
Technical electives‡	16	Technical Writing	4

*These courses are usually taken in the freshman year.

†This course is usually taken in the sophomore year.

‡Technical electives may include Computer Networks or Computer Security.

Electrical Engineering Technology Program

Ronald E. Scott, Sc.D., P.E., *Coordinator for Electrical Engineering Technology*

Degree Offered: Bachelor of Science in Engineering Technology

Electrical engineering technology deals with the design and operation of equipment and systems related to power, communications, data processing, and electrical control. Its major functions include:

- generation, transmission, and distribution of electrical energy for light and power purposes;
- development and production of equipment for telephone, radio, television, radar, and communication;
- design and construction of data-processing systems and analog or digital computers;
- application of electrical and electronic devices in the control of processes and manufacturing.

■ Professional Preparation

The electrical engineering technology program is designed to provide the student with a broad education through a basic core curriculum. Theory courses are at the upper end of the technology spectrum. Technical electives are offered to accommodate the student's area of interest.

The higher theoretical level provided in the program also prepares students to continue their education toward a Master of Technology degree or more theoretical engineering science subject areas.

The electrical engineering technology program aims to supply some of the personnel needs of complex and high-technology industries. The nature of high-technology industries demands close communication and cooperation between technologists and engineers.

■ Five-Year Cooperative Education Program

Since electrical engineering technology derives many fundamentals from developments in the pure sciences, the program begins with basic courses in mathematics and physics. The freshman year also includes literature and engineering graphics to aid students in developing skills with which to express themselves. The freshman program is similar for electrical and mechanical engineering technology. (See page 150.)

In the upperclass years, courses are divided into four sequences: circuits and systems, including feedback control; microwave devices; energy conversion, emphasizing electromagnetic devices; and laboratory work. Current practice is stressed. Senior year electives enable students to acquire both depth and breadth.

■ Course Requirements

General

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
College Algebra*	4	Computer Programming for	
Pre-Calculus*	4	Engineering Technology*	4
Calculus I*	4	Physics I, II, and III*	12
Calculus II and III†	8	Physics Laboratory I, II, and III*	3
English*	8	Social Science/Humanities electives	20
Principles of Economics†	4	Speech/Communications elective	4
Engineering Graphics I and II*	8	Open elective	4

Professional

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Circuit Analysis I and II [†]	8	Distributed Systems	4
Circuit Analysis III and IV	8	Circuits Laboratory I [†]	2
Electronics I, II, and III	12	Circuits Laboratory II	2
Control Engineering I and II	8	Electronics Laboratory	2
Engineering Analysis I	4	Advanced Electronics	
Energy Conversion	4	Laboratory I, II, and III	6
Electrical Measurements	4	Pulse and Digital I	4
Mechanics [†]	4	Technical electives [‡]	16
Digital Computers I and II	8	Technical Writing	4

*These courses are usually taken in the freshman year.
†These courses are usually taken in the sophomore year.
‡Technical electives may include Power Systems or Communication Systems.

Mechanical Engineering Technology Program

Thomas E. Phalen, M.S., P.E., *Coordinator for Mechanical Engineering Technology*

Degree Offered: Bachelor of Science in Engineering Technology

The objectives of this program are to prepare graduates for support activities in mechanical engineering technology. A technical field that deals with the use of machinery to harness power resources and perform useful work, mechanical engineering technology is concerned with static forces, motion, and the kinetics of devices activated by hydraulic, electrical, mechanical, or thermodynamic forces. Major functions of the mechanical engineering technologist include:

- design and installation of all kinds of machinery, from pocket watches to the largest energy-producing facilities;
- development and production of engines and transport equipment, as in automobiles, aircraft, ships, or railway cars;
- construction and operation of furnaces, boilers, as well as heating and air-conditioning equipment, for the control of atmospheric and environmental conditions and associated heat transfer.

■ **Professional Preparation**

Program participants apply principles of science and mathematics to chosen fields, converting theories into practical techniques and processes. They are shown how to communicate technical information effectively so that they may become integral components of an engineer-technologist-technician design and operations team.

■ **Five-Year Cooperative Education Program**

Since machinery is the predominant concern of the mechanical engineering technologist, the program of study offers considerable training in the principles underlying the design and operation of engines, power transmission devices, machine tools, and other machinery. This emphasis, of course, implies a thorough study of the physical laws concerning motion and transfer of energy. The study of materials, thermodynamics, and applied mechanics occupies a prominent place in the program.

These studies help provide the degree candidate with a broad foundation in those fundamental subjects essential to the understanding of current practice. The freshman-year program in the School of Engineering Technology is similar for electrical and mechanical engineering technology. (See page 150.) Seniors have elective choice and the opportunity for specialization.

■ Course Requirements

General

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
College Algebra*	4	Physics Laboratory I, II, and III*	3
Pre-Calculus*	4	Engineering Design Graphics I and II	8
Calculus I*	4	Computer Programming for	
Calculus II and III†	8	Engineering Technology	4
English I*	8	Social Science/Humanities electives	16
Principles of Economics	4	Chemistry	4
Physics I, II, and III*	12	Speech/Communications elective	4
Engineering Economy	4		

Professional

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Mechanics A and B†	8	Thermodynamics A and B	8
Mechanics C	4	Fluid Mechanics A and B	8
Stress Analysis A and B	8	Technical Laboratories A, B, C, D, E	10
Materials A	4	Refrigeration and Air Conditioning	4
Kinematics	4	Heat Transfer	4
Electricity and Electronics I	4	Machine Shop	4
Measurement and Analysis		Technical electives‡	12
Laboratory	2	Open elective	4
Mechanical Design A and B	8	Technical Writing	4

*These courses are usually taken in the freshman year.

†These courses are usually taken in the sophomore year.

‡Technical electives may include Mechanical Vibration or Power Generation.

College of Nursing



Eileen H. Zungolo, M.Ed., Ed.D., R.N., *Dean*
Ellen T. Daly, M.S., Ed.D., R.N., *Interim Associate Dean*
Christine E. Letzeiser, M.S., R.N., *Assistant Dean*

Associate Professors

Carol Easley Allen, M.A.,
Ph.D., R.N.
Jane F. Aroian, M.S.N., Ed.D.,
R.N.
Olivia M. Breton, M.Ed., R.N.
Elaine L. Capozzoli, M.A.,
Ph.D., R.N.
Janet A. Carroll, M.S., R.N.
Margery M. Chisholm, M.S.,
Ed.D., R.N.
M. Paula Fellows, M.S., R.N.
Ann C. Galligan, M.S., C.A.G.S.,
Ed.D., R.N.
Jean P. Gilbert, M.S., Ed.D.,
R.N.
Lee Ann Hoff, M.S.N., Ph.D.,
R.N.

M. Marcia Lynch, M.S.N.,
D.N.Sc., R.N.
Susan C. Marchessault,
M.S.N., R.N.
Geraldine A. Medici, M.S., R.N.
Patricia Meservey, M.S.,
Ph.D., R.N.
Carole Shea, M.S., Ph.D., R.N.
Marilyn M. Smith, M.S.,
M.B.A., R.N.
Nancy L. Walden, M.S.N., R.N.
Mary E. Wilcox, M.S., R.N.
M. Delaine Williamson, M.S.,
M.P.H., R.D.

Assistant Professors
Michelle Beauchesne, M.S.,
D.N.Sc., R.N.

Nancy N. Carr, M.S., R.N.
Mary Anne Gauthier, M.S.N.,
Ed.D., R.N.
Elizabeth M. Howard, M.S.,
Ph.D., R.N.
Joan M. Jacobson, M.S.,
Ph.D., R.N.
Barbara Kelley, M.S., M.P.H.,
Ed.D., R.N.
Carol Williams, M.S.,
D.N.Sc., R.N.

Lecturers

Margaret McAllister, M.A.,
Sp.CLN., R.N.
Donna H. Newby, M.S.N., R.N.
Elaine K. Small, M.S., R.N.

Degree Offered: Bachelor of Science in Nursing

The College of Nursing program is designed to prepare professional nurses able to practice nursing in a variety of health-care settings, whether in the private or public sectors, traditional or high-tech. The need for professional nurses in the United States and abroad translates into tremendous career opportunities for the nurse with a baccalaureate degree.

Rapid changes in health care, especially those related to age groups, care settings, and technology, require the professional nurse to be up-to-date in theory and practice, and in the ability to translate new knowledge and skills into health care for individuals, families, groups, and communities.

■ **Professional Preparation**

As primary health-care providers, nurses engage in a broad range of health promotion and teaching activities and coordinate care in every sector of the health-care system. They have major roles in wellness and health promotion, in acute care, and in long-term care for chronic illness. Accordingly, the College of Nursing aims to

- provide individuals with a broadly based educational experience;
- prepare professional nurses capable of practicing in a variety of settings;
- provide the stimulus and education for ongoing personal and professional growth;
- provide professional opportunities for individuals from diversified backgrounds and/or who have changing career goals;
- provide opportunities through cooperative education for the integration of theory with practice in selected settings;
- provide the educational background for graduate study in nursing.

■ **Five-Year Cooperative Education Program**

The study of professional nursing begins in the freshman year. Clinical experience in health-care settings is introduced in the second year of the program.

The nursing curriculum includes a variety of educational strategies and enables students to develop the clinical skills and judgment that permeate the practice of professional nursing. The curriculum offers instruction in scientific theory and research in nursing, the humanities, and the biological, physical, and social sciences. To ensure a liberal education, more than 50 percent of the coursework in the College of Nursing is centered in the sciences and humanities.

The curriculum also provides many opportunities for students to learn about the health needs of society and to begin providing high quality nursing care. Students have planned learning experiences in the classroom and health-care settings under the instruction and guidance of the faculty. Approximately 20 health-care agencies in Greater Boston provide students with experience in giving nursing/health care to clients in acute-care, rehabilitative care, and community health agencies.

In addition to their academic courses, all students are required to meet the Cooperative Plan of Education requirement. This program allows students to sample a variety of health care environments before committing to a specific career path. Cooperative education experiences generally are paid, full-time professional positions in settings relevant to a student's career interests.

Students completing the five-year baccalaureate nursing degree at Northeastern have acquired a much greater practical experience base than is available in many other baccalaureate nursing programs. The graduates of our program are able to make the transition into professional nursing practice with ease. Health care agencies actively seek out Northeastern University baccalaureate graduates.

■ **Honors Program** See page 19.

- **Honor Society** Sigma Theta Tau—see page 203.

- **Graduation Requirements**

The College of Nursing reserves the right to amend courses, program, and degree requirements to fulfill its educational responsibility to respond to relevant change. Degree candidates must complete all prescribed courses, a minimum of 177 quarter hours of credit. An overall quality-point average of C (2.0), overall science quality-point average of C, and a C grade in all required nursing courses is required. Degree requirements are based upon the year of graduation, determined by the date of entry or re-entry into the College of Nursing. Degree requirements and the year of graduation for a student who fails to make normal academic progress for more than two quarters will be subject to review and possible change. Candidates also must meet the requirements of the Department of Cooperative Education.

- **Graduation with Honors** See page 41.

- **Special Requirements**

Prior to entering, every student must have a physical examination, including a Rubella titre and immunization for MMR (measles, mumps, and rubella), tetanus, and hepatitis B. Each year thereafter, the student must receive a health clearance by having a PPD (tuberculin test). All students must carry malpractice insurance. Arrangements for this insurance are made by the University. Students in the College of Nursing are required to wear the school uniform in clinical laboratory areas during academic quarters. A modification of the uniform is worn during cooperative work periods. All students assigned to a clinical nursing course must be certified in cardiopulmonary resuscitation (CPR). Students enrolled in a community health nursing course must have access to a car.

- **Transfer Credit**

Credit is granted toward a Northeastern degree for any reasonably equivalent course with a C (2.0) or better grade from another accredited institution. Nursing courses are evaluated by the College of Nursing faculty to determine whether the courses meet curriculum requirements. Students requesting transfer credit must provide supporting documentation such as transcripts and course descriptions.

- **Accelerated Transfer Student Track**

The College of Nursing welcomes transfer students and career changers who have a degree in another field, or who have completed a minimum of 38 quarter hours of transfer credits, including Chemistry I and II and Anatomy and Physiology I and II. Students are accepted to this track for the fall quarter only. Once accepted as an accelerated transfer, the student follows a fixed curriculum plan that includes a minimum of three quarters of cooperative education experience. Students may complete program requirements in approximately 2 years 9 months.

- **The R.N. to B.S.N. Option**

The College of Nursing accepts registered nurses who wish to complete requirements for the Bachelor of Science in Nursing degree. The length of the program varies, depending on the individual's previous educational experience and ability to achieve advanced placement through selected testing methods. The college accepts either the Act Proficiency Examination Program (ACT PEP) or the National League for Nursing Mobility Profile II Examination for advanced placement.

■ Facilities

The college occupies Robinson Hall on the main campus of the University. In addition to faculty and administrative offices, a nursing resource unit is available for student use. The Nursing Resource Unit (NRU), which is located at 208–209 Robinson Hall, is a simulated hospital setting for student learning. The unit houses sophisticated equipment, such as the ACTRONICS interactive video system for CPR (cardio-pulmonary resuscitation) learning, as well as several personal computers and a selection of computer-assisted instructional software.

The College's Office of Student Affairs, in 211 Robinson Hall, is the central source of academic support services and assistance to undergraduate students in the College of Nursing. Students are assigned a nursing faculty adviser by this office, and all student files are maintained here.

■ Affiliations

The College of Nursing is a member of the National Student Nurses' Association (NSNA). All College of Nursing students are eligible to join the NSNA, which is the largest independent student organization in the country. Membership benefits include a subscription to *Imprint*, scholarships, reduced rates for the *American Journal of Nursing*, monitoring of legislation that affects nursing students, and educational programs and conventions.

■ Student Government

Students have both a right and a responsibility to participate in College of Nursing policy making and evaluation. The Nursing Student Government is a formal organization made up of volunteer student members who are interested in

- fostering high educational standards for students;
- promoting the quality of student life;
- promoting student involvement in the governance of the College by being the official liaison to College of Nursing faculty and administration.

■ Accreditation

The program of the College of Nursing is fully accredited by the National League for Nursing and approved by the Board of Registration in Nursing of the Commonwealth of Massachusetts. This accreditation and approval indicate that the program meets educational standards for faculty, curriculum design, student quality, and overall University support. The College of Nursing subscribes to the standards established by the American Association of Colleges of Nursing, of which it is a member.

■ Certification/Licensure

The college offers a five-year curriculum that leads to the degree of Bachelor of Science in Nursing and allows graduates to take the National Council Licensing Examination (NCLEX) to become registered nurses. Nurses must meet specific requirements to obtain a license from the state in which they wish to practice. For Massachusetts licensure, these include graduating from a program approved by the Board of Registration in Nursing of the Commonwealth of Massachusetts and passing the National Council Licensing Examination for Registered Nurses.

■ Graduate Education

For information on graduate degrees in nursing, see page 184.

■ **Sample Freshman-Year Program**

First Quarter

Human Biology
Fundamentals of Mathematics
English
Nursing

Second Quarter

General Chemistry
Anatomy and Physiology I
English
Nursing

Third Quarter

General Chemistry
Anatomy and Physiology II
Sociology
Human Nutrition

■ **Course Requirements**

General

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Human Biology	4	Growth and Development I and II	8
English	8	Pharmacology	3
General Chemistry	10	Fundamentals of Psychology I and II	8
Mathematics	4	Principles of Sociology	4
Microbiology	4	Social Anthropology	4
Anatomy and Physiology	12	Electives*	28
Middler-Year Writing Requirement	4		

Professional

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Introduction to Professional Nursing and the Health System	4	Nursing, Common Problems	7
Introduction to the Theoretical Basis for Nursing Practice	4	Psychiatric-Mental Health Nursing	7
Human Nutrition	4	Medical-Surgical Nursing	9
Nursing, Basic Human Needs I	6	Maternal-Child Nursing	9
Nursing, Basic Human Needs II	6	Community Health Nursing	9
Pathophysiological Concepts for Clinical Nursing	4	Issues in Contemporary Nursing	5
		Introduction to Nursing Research	4

*Designated electives are 8 Q.H. of humanities, 4 Q.H. of history, 4 Q.H. of computer science, and 12 Q.H. of general electives.

■ **Electives**

The College of Nursing offers electives that enable students to satisfy their personal objectives.

<i>Course</i>	<i>Q.H.</i>
Advanced Clinical Care	4
Health Assessment	4
Independent study elective	2
Life Crisis Analysis and Response	4
The Nurse Entrepreneur	4
The Nurse Planner and Coordinator of Nursing Care	4

Note: In addition to the above courses, students may choose to take Basic ROTC.

College of Pharmacy and Allied Health Professions



James J. Gozzo, Ph.D., *Dean*

Mehdi Boroujerdi, Ph.D., *Associate Dean, Pharmacy, and Director, Graduate School,
Pharmacy and Allied Health Professions*

Patrick F. Plunkett, Ed.D., *Associate Dean, Allied Health Professions and Student Affairs*

Ann M. Ahern, M.Ed., *Director, Office of Student Services*

Nancy P. Warner, M.S., *Academic Counselor*

Leonard H. Hairston, *Budget Coordinator*

Carol M. Konis, *Assistant to the Dean*

Barry Kass, M.B.A., *Director, Continuing Education and Development*

The College of Pharmacy and Allied Health Professions has adopted the Cooperative Plan of Education and a highly innovative academic program designed to meet the demand for well-educated pharmacists and allied health professionals. The program enables students to prepare to become effective professional practitioners, to enter graduate schools, and to obtain employment in many areas responsible for the delivery of health care.

■ **Professional Preparation**

The fundamentals of the college's approach to health-care education are as follows:

- a curriculum of highly relevant and closely integrated basic courses in the physical, biological, behavioral, and administrative sciences;
- on-site involvement in clinical patient care;
- a cooperative education work program, including a pharmacy externship-internship period and a clinical component;
- a commitment to the search for and advancement of new and progressive concepts, ideas, and philosophies of education and professional practice.

■ **Honors Program** See page 19.

■ **Honor Society** Rho Chi Society—see page 203.

■ **Graduation with Honors** See page 41.

■ **Facilities**

The college occupies the Mugar Life Sciences Building. This building and the well-equipped laboratories and classrooms of the Amelia Peabody Health Professions Center fulfill the physical needs of a growing and progressive college. In addition to faculty and administrative offices, a drug information and resource center, and the graduate school, there are laboratories for clinical chemistry, medicinal chemistry, prescription pharmacy, hematology, immunology, pharmacology, respiratory therapy, health information administration, and clinical microbiology. Animal rooms and a wide range of audiovisual materials and equipment are also housed in this five-story structure. Research facilities are available for upperclass students who participate in original research projects.

■ **Transfer Credit**

The College of Pharmacy and Allied Health Professions may accept qualified transfer students who have successfully completed one or more years of preprofessional coursework in an accredited college or university. No student transferring from another college or university may receive a degree unless the last three years of academic work immediately preceding graduation have been completed at Northeastern. Exceptions may be made for students transferring from another college of pharmacy. For more information, see page 14.

■ **Accreditation**

Each of the programs offered by the college is accredited by the appropriate professional group. The college holds memberships in both the American Association of Colleges of Pharmacy and the American Society of Allied Health Professions.

■ **Graduate Education** See page 184.

Health Information Administration Program

(Health Record Administration)

Leslie A. Blide, Ed.D., R.R.A., *Associate Professor and Acting Director*

Degree Offered: Bachelor of Science

This program enables students to acquire the knowledge and skills necessary to design, implement, and maintain manual and computerized health information systems. Students also study how to plan, organize, and direct medical record services; to develop, analyze, and evaluate medical data and data systems; to work with medical and administrative staffs; and to participate in research projects which use health information.

■ Professional Preparation

Health information administrators organize, manage, and evaluate medical record services in health facilities and in industry. The program offers the opportunity for preparation in administration, departmental and hospital management and organization, and data processing.

Health information professionals also market, design, and implement medical computer systems; work as members of consulting teams; and analyze data and manage departments for hospitals, insurance companies, federal agencies, and research institutes.

■ Five-Year Cooperative Education Program

The Health Information Administration Program is offered on the Cooperative Plan of Education. Successful completion of the prescribed curriculum, including directed study at an affiliated health center, leads to the awarding of a bachelor of science degree. Graduates are eligible to take the national registration examination given by the American Medical Record Association.

During the first two years, students concentrate on liberal arts and sciences, including required human anatomy and physiology courses and an overview of microbiology. Courses in health-care science help the student prepare for a role in health administration and health-care delivery.

Professional courses in health information science, medical terminology, and hospital law are complemented by directed applied study in health information science at an affiliated health facility.

■ Certificate Program

The Health Information Administration Certificate Program is designed for candidates holding a baccalaureate or master's degree who desire a new career. This accelerated three-quarter curriculum for students who have demonstrated leadership potential and self-direction includes an integrated clinical practice experience. This clinical practice begins in the second quarter and includes a three-week management experience at the conclusion of the last quarter.

■ Accreditation

The Health Information Administration Program is accredited by the Committee on Allied Health Education and Accreditation (CAHEA) of the American Medical Association in cooperation with the Council on Education of the American Medical Record Association (COE-AMRA).

■ **Sample Freshman-Year Program**

First Quarter	Second Quarter	Third Quarter
Biology I	Arts and Sciences elective	Computer elective
English I	Biology II	English II
Mathematics	Mathematics	Microbiology
Orientation to Health Records I	Professional Dynamics in the Health-Care Delivery System	Psychology
Psychology		

Note: In addition to the above courses, students may choose to take ROTC.

■ **Course Requirements**

General			
Course	Q.H.	Course	Q.H.
English Composition and English Literature*	8	Psychology*	8
Mathematics	8	Sociology <i>or</i> Anthropology	4
Biology I and II*	8	Arts and Sciences electives	16
Microbiology*	3	Introduction to Communication	
Organizational Behavior	4	Skills	4
Introduction to Computer Science	4	Electives	12
		Middler-Year Writing Requirement	1
Professional			
Course	Q.H.	Course	Q.H.
Language of Health Professions	2	Directed Practice	7
Health Records Science I–IV	16	Medical Computer Applications	4
Language of Medicine	4	Quality Assurance	4
Foundations of Medical Science	6	Independent Study	4
Hospital Law	2	Special Topics	4
Management of Health Record Services	12	Health Record Professional	2
Introduction to Health Data Research	4	Professional Dynamics in the Health-Care Delivery System*	4
Seminar in Health Records	2	Introduction to Data Processing for Health Professionals	4
Statistics	4	Anatomy and Physiology	10
Training and Development for Health-Care Professionals	2	Systems Analysis	4

*These courses are usually taken in the freshman year.

Department of Cardiopulmonary Sciences

Mary E. Watson, Ed.D., *Associate Professor and Acting Chairperson*

Associate Professors	Assistant Professor
Thomas A. Barnes, Ed.D.	Glen J. Low, M.Ed.
Patrick F. Plunkett, Ed.D.	

Degree Offered: Bachelor of Science in Respiratory Therapy

■ **Respiratory Therapy Program**

Respiratory therapy is instrumental in the diagnosis, treatment, management, and preventive care of patients with cardiopulmonary problems. Patients suffering from a variety of acute or chronic disabling conditions may be found in newborn nurseries, surgical and medical units, emergency rooms, outpatient departments, and intensive care units.

■ **Professional Preparation**

Respiratory therapists are involved in the treatment of disorders such as cardiac failure, asthma, pulmonary edema, emphysema, cerebral thrombosis, drowning,

hemorrhage, and shock. Responsible for life support of the patient through airway management, artificial ventilation, external cardiac massage, and other sophisticated emergency support measures, the respiratory therapist is a life-support specialist.

Working under physicians' orders, respiratory therapists carry out specific therapeutic measures. They must be experts in providing and recommending specialized modalities of respiratory care. They must be competent in such areas as medical gas administration, including oxygen; humidification, aerosols, and intermittent positive pressure breathing (IPPB); chest physiotherapy, cardiopulmonary resuscitation, mechanical ventilation, airway management, and pulmonary function studies; blood gas analysis; and physiologic monitoring.

■ **Five-Year Cooperative Education Program**

Students enter the college as majors in the respiratory therapy program. Mathematics, chemistry, and the physical, biological, medical, and health sciences offer the bases for professional instruction in respiratory therapy. English, psychology, and elective courses in the humanities and social sciences provide a liberal arts background. Clinical study at major teaching hospitals permits direct patient care and the immediate application of highly specialized techniques.

The curriculum leads to the bachelor of science degree in respiratory therapy and includes academic quarters at the University, a structured clinical program, and assigned co-op quarters. Successful completion of the first three and one-half years of the program makes students eligible for the first part of the examinations administered by the National Board for Respiratory Care.

■ **Cardiovascular Technology Certificate Program**

A nine-month program in cardiovascular technology is available for professionals with a baccalaureate or master's degree who are interested in working in a cardiac catheterization laboratory. The curriculum allows students with the science background needed to master professional courses to integrate didactic and clinical practice. Graduates are eligible to take the National Board Examination for Registered Cardiovascular Technologists.

■ **Perfusion Technology Certificate Program**

The perfusion technology certificate program is open to professionals with a baccalaureate or master's degree. Candidates must have the science background needed to master professional courses in the curriculum. The curriculum allows students to integrate didactic, laboratory, and clinical practice courses over a 12-month period. Graduates of the program are eligible to take the National Board Examination for Certified Cardiovascular Perfusionists.

■ **Respiratory Therapy Certificate Program**

An accelerated program in respiratory technology is available for professionals with a baccalaureate or master's degree. The curriculum allows students with the science background needed to master professional courses to integrate didactic, laboratory, and clinical practice over a 12-month period. Graduates of the program are eligible to take the National Board Examination for Registered Respiratory Therapists.

■ **Accreditation**

Both the degree and accelerated programs are accredited by the Committee on Allied Health Education and Accreditation, sponsored by the American Medical Association.

■ **Sample Freshman-Year Program**

First Quarter	Second Quarter	Third Quarter
English I	Animal Biology	Calculus
General Biology	Arts and Sciences elective	English II
General Chemistry I	Mathematics	General Chemistry II
Psychology	Professional Dynamics in the	Microbiology
Respiratory Therapy	Health-Care Delivery System	Respiratory Therapy
Seminar I	Respiratory Therapy Seminar II	Seminar III

Note: In addition to the courses above, students may choose to take Basic ROTC.

■ **Course Requirements**

General

Course	Q.H.	Course	Q.H.
Biology	8	Computer electives	8
Anatomy and Physiology	10	English Composition and Literature	8
Microbiology	4	Arts and Sciences electives	24
General Chemistry	10	Middler-Year Writing Requirement	1
Physics	4	Psychology	4
Mathematics	8		

Professional

Course	Q.H.	Course	Q.H.
Respiratory Therapy Seminars	3	Cardiopulmonary Laboratory	
Clinical Seminars	2	Techniques	4
Professional Practice Labs I, II, III, and IV	4	Cardiopulmonary Laboratory Practice	1
Cardiopulmonary Physiology	4	Clinical Practice I	4
Advanced Clinical Physiology	4	Clinical Practice II	4
Pathology	4	Advanced Medical Monitoring	4
Introduction to Patient Care	4	Respiratory Care for the Neonatal	
Introduction to Respiratory Care	4	Patient	4
Respiratory Care for the Med-Surgical		Cardiopulmonary Diseases	4
Patient	4	Professional Dynamics in the	
Moral Problems in Medicine	4	Health-Care Delivery System	4
Respiratory Care for the Critical Patient	4	Professional electives	16
Pharmacology	4	Clinical Practice III	6
Introduction to Pediatric Respiratory Care	2		

Department of Medical Laboratory Science (Medical Technology)

Edward W. Schroder, M (ASCP), Ph.D., *Associate Professor and Chairman*

Professor	Associate Professors	Assistant Professors
James J. Gozzo, Ph.D.	Judith T. Barr, CLS (NCA), Sc.D.	Panayiota Araszkievicz, Ph.D.
	Britta L. Karlsson, M (ASCP), M.S.	Daniel H. Fisher, C (ASCP), Ph.D.

Degrees Offered: Bachelor of Science, Associate in Science

Medical technology involves the application of principles of natural, physical, and biological sciences to laboratory determinations used in the diagnosis and treatment of disease and in the maintenance of health.

■ **Professional Preparation**

The demand for properly educated and certified medical technologists, medical laboratory technicians, and research or industrial laboratory scientists is increasing as a result of greater emphasis on health-care delivery, and as commercial applications of biotechnology are developed. With opportunities available in hematology, immunohematology, chemistry, microbiology, and immunology, students may prepare

for positions not only in hospital laboratories, but also in biological research, industrial, and governmental institutions. Cooperative education experiences in hospitals, clinics, research, and industry enable graduates to explore a variety of career options. Opportunities exist for six-month co-op work experiences in foreign countries. Qualified graduates have gone on to graduate and professional schools.

■ **Five-Year Cooperative Education Program**

The College of Pharmacy and Allied Health Professions offers a five-year modified cooperative course of study leading to the bachelor of science degree.

During the junior and senior years, qualified students are assigned to the hospital components of the program. To qualify, students must have achieved an acceptable quality-point average; successfully completed all course requirements; and met other criteria of the Clinical Studies Admission Committee. Professional courses in hematology, microbiology, immunology, parasitology, chemistry and instrumentation, and immunohematology are included in both the University and hospital components of the program. Baccalaureate students may pursue a research project in one of the above concentrations, or complete a computer science minor, or other relevant minor.

Students in the five-year major who decide not to complete their course of study may transfer into the three-year associate degree program.

■ **Three-Year Co-op Program**

Students enter the college as medical laboratory science (medical technology) majors. This three-year modified co-op program leads to an associate degree.

The first two years of academic study parallel the baccalaureate program. During the third year, students alternate related co-op work experience with clinical applied studies at affiliated hospitals. To qualify for clinical studies, students must have an acceptable quality-point average and must have successfully completed all other requirements of the department.

■ **Certification**

Upon completion of the professional component of the three-year program, students are eligible to take national certification examinations for medical and clinical laboratory technician. After completing the five-year baccalaureate degree, students may be eligible for national certification examinations in medical technology, clinical laboratory science, or one of the specialties of medical laboratory science. Some states may require additional licensure examinations.

■ **Certificate Programs**

The postbaccalaureate certificate (PBC) programs in Medical Laboratory Science enable students with a baccalaureate degree and sufficient background in the biological and chemical sciences to become eligible for certification in microbiology, chemistry, hematology, or immunohematology. Depending upon the specialty, students must complete 26 to 33 quarter hours of professional coursework, which must include applied study at an affiliated clinical site. After completing the program, students may be eligible for the national certification examination in a specialty area.

■ **Accreditation**

The associate in science and the bachelor of science degree programs are accredited by the Committee on Allied Health Education and Accreditation of the American Medical Association.

■ **Sample Freshman-Year Program**

First Quarter	Second Quarter	Third Quarter
Mathematics <i>or</i> Calculus	General Chemistry I	Electives
General Biology	Animal Biology	English II
Medical Laboratory Science	Professional Dynamics in the	Urinalysis
Orientation I	Health-Care Delivery System	General Chemistry II
English I	Medical Laboratory Science	
Elective	Orientation II	
	Computer Science elective	

■ **Course Requirements for the Baccalaureate Degree**

General			
Course	Q.H.	Course	Q.H.
English and English Literature*	8	Genetics and Developmental Biology	4
Biology—General and Animal*	8	Physics	10
Mathematics <i>or</i> Calculus*	4	Humanities electives	12
General Chemistry*	10	Social Science electives	8
Organic Chemistry [†]	10	General electives (includes Statistics	
Physiology [†]	8	and Computer Science)	16–20
Cell Biology	4	Middler-Year Writing Requirement	1
Professional			
Course	Q.H.	Course	Q.H.
Medical Laboratory Science		Advanced Clinical Chemistry I and II	8
Orientation I and II*	2	Advanced Clinical Microbiology	4
Urinalysis*	3	Applied Clinical Study (at hospital)	24
Basic Hematology I [†]	2	Laboratory Management	2
Basic Hematology II [†]	3	Health Science Education	2
Basic Immunohematology [†]	4	Parasitology [†]	3
Basic Immunology [†]	2	Senior Seminar	2
Basic Chemistry and Instrumentation [†]	5	Professional Dynamics in	
Basic Clinical Microbiology I and II [†]	7	the Health-Care Delivery System*	4
Advanced Hematology I and II	4	Clinimetrics	2
Advanced Immunohematology	2	Immunopathology	3

*These courses are usually taken in the freshman year.

[†]These courses are usually taken in the sophomore year.

■ **Course Requirements for the Associate Degree**

General			
Course	Q.H.	Course	Q.H.
English and English Literature*	8	Physiology [†]	8
Biology—General and Animal*	4	Humanities elective	4
Mathematics <i>or</i> Calculus*	8	Computer Science	4
General Chemistry*	10	General elective	4
Professional			
Course	Q.H.	Course	Q.H.
Medical Laboratory Science		Basic Clinical Microbiology I and II [†]	7
Orientation I and II*	2	Basic Immunohematology [†]	4
Urinalysis*	3	Basic Immunology	2
Basic Hematology I [†]	3	Basic Clinical Chemistry and	
Basic Hematology II [†]	3	Instrumentation	5
Professional Dynamics in		Applied Study (at hospital)	12
the Health-Care Delivery System*	4	Parasitology	3

*These courses are usually taken in the freshman year.

[†]These courses are usually taken in the sophomore year.

Pharmacy Program

Department of Pharmaceutical Sciences

Richard C. Deth, Ph.D., <i>Professor and Acting Chairperson</i>	<i>Associate Professors</i> Norman R. Boisse, Ph.D. Mehdi Boroujerdi, Ph.D. Robert A. Schatz, Ph.D. Barbara L. Waszczak, Ph.D.	Jonathan Freedman, Ph.D. George C. Hwang, Ph.D. Gerald S. Jones, Ph.D. <i>Clinical Associate Professor</i> Ralph H. Loring, Ph.D.
<i>Professors</i> Roger W. Giese, Ph.D. James J. Gozzo, Ph.D. Robert N. Hanson, Ph.D. John L. Neumeyer, Ph.D. Elliot Spector, Ph.D.	<i>Assistant Professors</i> Nancy R. Chen, Ph.D.	<i>Clinical Instructor</i> James M. Dixon, M.S.

Department of Pharmacy Practice

Larry N. Swanson, Pharm.D., <i>Associate Professor and Acting Chairperson</i>	<i>Associate Professors</i> Robert J. Cersosimo, Pharm.D. Gerald R. Donehew, Ph.D. Samuel J. Matthews, Pharm.D. Michael E. Montagne, Ph.D.	<i>Assistant Professor</i> David I. Min, Pharm.D. <i>Clinical Assistant Professor</i> Todd A. Brown, B.S.
<i>Professors</i> Arnold S. Goldstein, L.L.M. Gerald E. Schumacher, Pharm.D., Ph.D.		

Degree Offered: Bachelor of Science in Pharmacy

■ Professional Preparation

Most pharmacists are associated with community practice; some are self-employed. Hospital pharmacy and institutional practice have attracted many practitioners and represent the fastest-growing areas of the profession. The increased use of the pharmacist as a drug consultant to medical and nursing staffs has broadened the scope of professional opportunity and given practitioners greater involvement as part of the health team.

Pharmacy also offers careers in research, manufacturing, government, law enforcement, and education. Many graduates of the pharmacy program go on to leading graduate and professional schools. Women comprise approximately 60 percent of the entering class.

■ Five-Year Cooperative Education Program

The College of Pharmacy and Allied Health Professions offers a five-year curriculum leading to the Bachelor of Science in Pharmacy degree. The curriculum offers arts and sciences courses in general education (the humanities and social sciences); mathematics and the basic physical and biological sciences; and courses in medicinal chemistry, pharmacology, pharmaceuticals, pharmacy administration, pharmacy practice, and clinical pharmacy.

The curriculum offers a blend of academic classroom and cooperative education work experiences. Students who successfully complete the five-year baccalaureate pharmacy degree must accomplish up to 3,000 hours of combined co-op and clinical clerkship experiences—a much greater practical experience base than other pharmacy programs offer. These experiences enable pharmacy graduates to easily make the transition into pharmacy practice.

The classroom experience is well structured and allows for the integration of the students' cooperative education experiences. In addition, the pharmacy program maintains close affiliations with many of the leading hospitals in the surrounding Boston area.

■ **Graduation Requirements**

Candidates for the Bachelor of Science in Pharmacy degree must complete all prescribed courses—a minimum of 177 quarter hours. An overall quality-point average of C (2.0) and a C average in required pharmacy courses are required. Students also must meet the requirements of the Department of Cooperative Education to be eligible for their degree.

■ **Accreditation**

The undergraduate pharmacy program offered by the College of Pharmacy and Allied Health Professions subscribes to the standards established by the American Council on Pharmaceutical Education and the American Association of Colleges of Pharmacy, of which it is a member.

■ **Sample Freshman-Year Program**

First Quarter	Second Quarter	Third Quarter
Fundamentals of Mathematics <i>or</i> Functions and Basic Calculus	Functions and Basic Calculus <i>or</i> Calculus	Calculus <i>or</i> free elective
General Chemistry I	Professional Dynamics	English II
Arts and Sciences elective	in the Health Care	General Chemistry II
General Biology	Delivery System	Arts and Sciences elective
Profession of Pharmacy	Animal Biology	
	English I	

Note: In addition to the above courses, students may choose to take Basic ROTC.

■ **Course Requirements**

General

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Fundamentals of Mathematics*	4	Organic Chemistry†	10
Functions and Basic Calculus*	4	Anatomy-Physiology†	10
Calculus*	4	Biochemistry†	5
General Chemistry*	10	Arts and Sciences electives (6)	24
English*	8	Middler-Year Writing Requirement	1
Biology*	8	Microbiology	3
Physics†	8	Computer elective†	4

Professional

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Pharmaceutical Calculations†	4	Professional Dynamics in the Health-Care Delivery System*	4
Pharmaceutics I and II, including laboratories	12	Professional electives (2)	8
Medicinal Chemistry/Pharmacology I, II, and III	17	Professional Practice Laboratory	1
Pharmacology Laboratory	1	Clinical Pharmacotherapeutics	5
Pharmaceutical Analysis and Quality Control	4	Pharmacokinetic Principles in Drug Therapy	4
Drug Information and Evaluation	3	Anti-infectives	5
Pathophysiology	4	Parapharmaceuticals	2
Toxicology	4	Nonprescription Medication	4
Biopharmaceutics/Pharmacokinetics	4	Interpersonal Skills for Health Professionals†	4
Jurisprudence	4	Pharmacy Externship	4
Pharmacy Administration	4	Social Pharmacology	4
Clinical Pharmacy Clerkship	15	Profession of Pharmacy*	1
Community Pharmacy Management <i>or</i> Hospital Pharmacy Management	4		

*These courses are usually taken in the freshman year.

†These courses are usually taken in the sophomore year.

■ Licensure

Pharmacists must meet certain requirements to obtain a license from the state in which they wish to practice. These requirements ordinarily include graduating from an accredited college of pharmacy, passing an examination given by a state board of pharmacy, and completing an internship or apprenticeship.

The internship is a period of supervised practical experience in a preceptor pharmacy. This requirement is generally satisfied during the cooperative education periods, which commence at the end of the student's second academic year. The salary earned during these periods of full-time employment may be used to help defray educational expenses. Students may apply up to 400 hours of the required academic clinical clerkship experience to their internship requirements. In addition, a college-directed externship adds to the total practice-oriented portion of the curriculum.

Toxicology Program

Robert A. Schatz, Ph.D., *Associate Professor and Director*

Lecturer

Diane M. Silverman, Ph.D.

Degree Offered: Bachelor of Science in Toxicology

Toxicology may be defined as the branch of science dealing with poisons, but it should not be restricted to this narrow definition. Toxicology involves all aspects of adverse effects of chemicals on biologic systems. This includes the mechanisms of their harmful effects and the conditions under which these harmful effects occur as well as socioeconomic considerations and legal ramifications. Forensic toxicology is a hybrid of analytical chemistry and fundamental toxicological principles and focuses on the medicolegal aspects of the harmful effects of chemicals.

The activities and contributions of toxicologists are many and varied. Biomedical toxicologists are concerned with intoxication by drugs and other chemicals. They are also involved with the demonstration of drug safety or danger prior to release on the market.

Industrial or environmental toxicologists are concerned with the recognition, identification, and quantitation of the relative hazards from occupational or public exposure to toxicants. This concern is closely related to private and government responsibilities to ensure the safety of workers and the general public in contact with industrial and commercial products.

■ Professional Preparation

The faculty of the toxicology program believes that increased concern over the safety of drugs, chemicals, and cosmetics throughout the environment and new legislation regarding toxic substances have created a need for toxicologists at the bachelor of science level.

Northeastern has created an innovative program in which diverse academic resources offer training in toxicology. The core curriculum is enhanced by contributions from the University's Institute of Chemical Analysis, Applications, and Forensic Sciences; the Marine Science Institute in Nahant; and the Environmental Engineering Department.

Numerous federal and local laws aimed at protecting the environment, safeguarding employees in their workplaces, and protecting consumers against hazardous household products have created a critical shortage of toxicologists. Employment

opportunities are being created in industry (chemical, cosmetic, and pharmaceutical firms) and government (Environmental Protection Agency, Food and Drug Administration, National Institute of Occupational Safety and Health). Toxicologists are also employed in police departments and various clinical settings. Qualified students may also consider entering law school, medical school, and graduate programs in toxicology.

■ **Five-Year Cooperative Education Program**

The toxicology program leads to the bachelor of science degree in toxicology in five years under the Cooperative Plan of Education. The curriculum is a combination of science, liberal arts, and professional courses that offers students the opportunity to prepare to practice toxicology in a variety of settings. Required and elective professional courses may be selected from medical laboratory science, chemistry, biology, sociology, criminal justice, computer programming, mathematics, and earth sciences.

Toxicology students may begin their cooperative experience during the summer of their freshman year.

■ **Sample Freshman-Year Program**

First Quarter	Second Quarter	Third Quarter
General Biology	Animal Biology	Calculus
English I	Functional Calculus	English II
Mathematics	General Chemistry I	General Chemistry II
Toxicology Orientation	Professional Dynamics in the	Arts and Sciences elective
Arts and Sciences elective	Health-Care Delivery System	

Note: In addition to the foregoing courses, students may choose to take Basic ROTC.

■ **Course Requirements**

General

Course	Q.H.	Course	Q.H.
Mathematics*	4	General Biochemistry	5
Calculus*	8	Microbiology	4
General Chemistry*	10	Biostatistics and Computers†	4
English*	8	Electives	28
Biology*	8	Middler-Year Writing Requirement	1
Physics†	8	Cell Biology	4
Organic Chemistry†	10	Professional electives	12
Anatomy-Physiology†	10		

*These courses are usually taken in the freshman year.

†These courses are usually taken in the sophomore year.

Professional

Course	Q.H.	Course	Q.H.
Pharmaceutical Analysis and Quality Control	4	Epidemiology	4
Medicinal Chemistry/Pharmacology I, II, and III	17	Basic MLS Clinical Chemistry and Instrumentation	5
Pathology	4	Professional Dynamics in the Health-Care Delivery System*	4
Toxicology I, II, and III	12	Environmental Toxicology	3
Pharmacology Laboratory	1	Current Issues in Toxicology	1
Biochemical Toxicology Laboratory	4	Fundamentals of Regulatory Risk Assessment	3
Community Health	4		

*These courses are usually taken in the freshman year.

Health-Care Curriculum Open Option Program

The Open Option Program is designed for students who are undecided about a profession but are interested in a career in health care. The program offers freshmen a core of courses designed to provide the basic scientific background required for each of the professional programs in the College of Pharmacy and Allied Health Professions in addition to a one quarter hour health careers seminar. Students are introduced to basic principles of health-care delivery and health-care agencies and services, and to the attitudes, behavioral aspects, and policies that affect health-care systems. They also complete some of the prerequisite courses required of all the professional programs.

With the aid of advisers, students refine their career goals and familiarize themselves with what is expected in various health-care professions. Subsequent selection of a professional program may then proceed more smoothly and confidently.

■ Open Option Courses

Students may complete the core courses in the first-year curriculum without selecting a major. Upon satisfactory completion of the first year, students select a major. Professions in the college include pharmacy, health information administration, medical laboratory science, respiratory therapy, and toxicology. Courses offered in the first-year Open Option are Animal Biology, English Composition, Functions of Basic Calculus, Fundamentals of Mathematics, General Chemistry I and II, General Biology, Introduction to Literature, and Professional Dynamics in the Health-Care Delivery System.

Satisfactory completion of all freshman-year courses, including the Open Option core curriculum, is necessary for admission to one of the professional programs of the college.

Special Note The Open Option plan does not apply to the Dental Hygiene Program.

Dental Hygiene Program

Degrees Offered: Associate and Bachelor of Science in Dental Hygiene

The Forsyth School of Dental Hygienists conducts a program of dental hygiene education in cooperation with Northeastern University. Students attend classes at both the Forsyth Dental Center and Northeastern. The dental hygienist is licensed to render preventive services to a patient under the supervision of a dentist, including administering dental prophylactic treatment, preparing dental radiographs, and teaching prescribed methods of maintaining dental health.

■ Two-Year Program

The first year includes courses in anatomy and physiology, chemistry, microbiology, histology, nutrition, dental materials, radiology, periodontology, pathology, head and neck anatomy, dental hygiene, and clinical dental hygiene instruction. In the second year, students take general courses, such as English, sociology, and psychology, and professional courses in public health, pharmacology, law and ethics, and dental hygiene. They also continue to receive clinical dental hygiene instruction.

■ Four-Year Program

Education at the baccalaureate level enhances the dental hygienist's opportunities, abilities, background, and values. The first year includes courses in general education and basic science with introductory courses in dental hygiene. The second

and third years provide core dental hygiene courses in theory and practice. Students are eligible for licensure exams at the end of the third year. The fourth year allows students to specialize in areas of dental hygiene or to increase their liberal arts background. This option is open to dental hygienists who already hold an associate degree in dental hygiene.

■ **Accreditation**

These programs are accredited by the Commission on Dental Accreditation of the American Dental Association, an accrediting body approved by the Department of Education and the Council on Post Secondary Accreditation.

■ **Certification/Licensure**

Graduates receive the Certificate in Dental Hygiene from the Forsyth School and the Associate in Science or Bachelor of Science in Dental Hygiene from Northeastern University. Graduates must satisfy the state dental hygiene licensure requirements before they may practice.

■ **Admissions**

Application should be made directly to the Forsyth School of Dental Hygienists Office of Admissions, 140 The Fenway, Boston, MA 02115. For an application and a copy of the college catalog, write that office or telephone 617-262-5200.

■ **Sample Freshman-Year Program for the Baccalaureate Degree**

First Quarter	Second Quarter	Third Quarter
Biology	Biology	Dental Anatomy
Dental Hygiene Orientation	Dental Hygiene Orientation	English II
English I	General Chemistry	General Chemistry
Mathematics	Mathematics	Microbiology
Psychology	Professional Dynamics in Health-Care Delivery Systems	Sociology

■ **Course Requirements for the Baccalaureate Degree**

General

Course	Q.H.	Course	Q.H.
English and English Literature	8	Humanities electives (includes English Writing)	8
Biology—General and Animal	8	Social Science electives (includes Psychology and Sociology)	12
Anatomy and Physiology	10	General electives (includes Statistics and Computer Science)	14–28
Mathematics	8		
General Chemistry	10		
Microbiology	4		

Professional

Course	Q.H.	Course	Q.H.
Dental Hygiene Orientation I and II	4	Law and Ethics	2
Dental Anatomy	2	Pain Control	2
Radiology	3	Community Health Extramural	3
Dental Hygiene	12	Research Study	3
Clinical Dental Hygiene	23	Advanced Public Health	4
Nutrition	2	Oral Health Gerontology	4
Histology	2	Advanced Principles of Dental Disease	4
Pathology	4	Advanced Periodontology Clinic	2
Periodontology	2	Interpersonal Skills for Health Professionals	4
Pharmacology	3	Professional Dynamics in Health-Care Delivery Systems	4
Head and Neck Anatomy	2	Professional electives	12–16
Dental Materials	2		
Special Patient Care	2		

■ **Sample Freshman-Year Program for the Associate Degree**

First Quarter

Clinical Dental Hygiene
Dental Anatomy
Dental Hygiene
General Chemistry I
Head and Neck Anatomy
Human Anatomy
and Physiology I
Radiology

Second Quarter

Clinical Dental Hygiene
Dental Hygiene
General Chemistry II
Histology
Human Anatomy
and Physiology II
Periodontology

Third Quarter

Clinical Dental Hygiene
Dental Hygiene
Dental Materials
Microbiology
Nutrition
Pathology

■ **Course Requirements for the Associate Degree**

General

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
English Composition and English Literature	8	Foundations of Psychology	4
Chemistry	8	Sociology	4
Microbiology	4	Human Anatomy and Physiology	10

Professional

<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Dental Anatomy	2	Periodontology	2
Radiology	3	Pharmacology	3
Dental Hygiene	12	Head and Neck Anatomy	2
Clinical Dental Hygiene	23	Dental Materials	2
Nutrition	2	Law and Ethics	2
Histology	2	Community Health Extramural	3
Pathology	4	Pain Control	2
Special Patient Care	2		

Alternative Freshman-Year Program (University College)

Students in the Alternative Freshman-Year Program are considered regular degree candidates with an undeclared major. The Alternative Freshman-Year Program is designed to help students strengthen basic skills in writing and mathematics. While helping students gain confidence in their ability to do college-level work, the program also offers an opportunity to consider several different areas of study before a major is selected. Through the combination of a carefully prescribed curriculum and the attention of professional counselors, students are helped to tailor a program to fit their individual needs. The same counselors are normally available on a continuing basis throughout the entire first year.

■ The Program

Students in the Alternative Freshman-Year Program begin with 12 to 16 quarter hours of credit in the first academic quarter. In the second and third quarters, students in most tracks take 16 quarter hours of credit each term. Students in the health sciences track take 15 quarter hours in the second quarter and 17 quarter hours in the third.

After completing the prescribed Alternative Freshman-Year Program with a cumulative quality-point average of 1.400 or better and fulfilling specific program requirements, students may continue their degree programs within University College or transfer, with sophomore status, to any program in the College of Business Administration or the College of Criminal Justice as well as certain programs in the Boston-Bouvé College of Human Development Professions and the College of Arts and Sciences. The College of Business Administration requires a 1.800 average in Mathematics for Business, Fundamentals of English II, Economics I, and Survey of Business and Management. Additional program requirements for students who would like to be admitted to sophomore status in the College of Pharmacy and Allied Health Professions are listed in the *Student Handbook*.

■ The Faculty

The University has carefully selected for the Alternative Freshman-Year Program faculty members who are aware of individual student goals and needs. Faculty and students meet in classes of not more than 25 students.

■ Student Services

Students in the program are considered regular day students even though they have unique schedules and a distinctively tailored curriculum. They have access to all counseling services, physical education facilities, and extracurricular programs.

Alternative Freshman-Year students are encouraged to make extensive use of the Academic Assistance Center (page 193) and the Math and Writing Centers (page 47). Students are frequently referred to the Learning Resources Center. The Counseling and Testing Center (page 194) is available for personal and academic counseling as well as vocational testing and counseling.

■ **Sample One-Year Program: Business Track**

First Quarter		Third Quarter	
Course	Q.H.	Course	Q.H.
Integrated Language Skills A	4	Economics I (or directed elective) [†]	4
Fundamentals of English I	4	History of Civilization B	4
Mathematics I*	4	Survey of Business and Management (or directed elective) [†]	4
History of Civilization A or Survey of Business and Management	(4)	Mathematics for Business	4
Total Quarter Hours	12–16	Total Quarter Hours	16
Second Quarter			
Course	Q.H.		
Integrated Language Skills B	4		
Fundamentals of English II	4		
Mathematics II*	4		
History of Civilization A or Economics I or Survey of Business and Management	4		
Total Quarter Hours	16		

*Students will be placed in one of three mathematics courses, depending on placement test results. Those receiving advanced placement may complete MTH 1114 during the freshman year.
[†]All business track students will complete HST 4110 in either the fall or winter quarter. ECN 4601 and MGT 4110 may be taken in the fall, winter, or spring; ECN 4601, in either the winter or spring quarter.

■ **Sample One-Year Program: Arts and Sciences, Criminal Justice, or Education Track**

First Quarter		Third Quarter	
Course	Q.H.	Course	Q.H.
Integrated Language Skills A	4	History of Civilization B	4
Fundamentals of English I	4	Introduction to Politics	4
Mathematics I*	4	Sociology II (or directed elective)	4
Sociology I	(4)	Directed elective [†]	4
Total Quarter Hours	12–16	Total Quarter Hours	16
Second Quarter			
Course	Q.H.		
Integrated Language Skills B	4		
Fundamentals of English II	4		
History of Civilization A	4		
Sociology II or Mathematics II	4		
Total Quarter Hours	16		

*Students will be placed in one of two mathematics levels, depending on placement test results.
[†]The directed elective is to be chosen with consideration for the student's intended major or to complete upperclass requirements such as ENG 1111 or MTH 1101.

■ **Sample One-Year Program: Health Sciences Track**

First Quarter		Third Quarter	
<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Math II	4	Biology I	4
Fundamentals of English I	4	General Chemistry II	5
Pre-Chemistry	5	Freshman English II	4
Integrated Language Skills Development I	2	Directed elective	4
<hr/>		<hr/>	
Total Quarter Hours	15	Total Quarter Hours	17
Second Quarter		Fourth Quarter	
<i>Course</i>	<i>Q.H.</i>	<i>Course</i>	<i>Q.H.</i>
Fundamentals of Mathematics	4	Biology II	4
General Chemistry I	5	Functions and Calculus	4
Integrated Language Skills Development II	2	Directed elective	4
Fundamentals of English II	4		
<hr/>		<hr/>	
Total Quarter Hours	15	Total Quarter Hours	12

Tuition and fees are the same as for students in the Basic, or Day, Colleges. (See pages 25–29.) Payment of the standard tuition during the first three academic quarters entitles students to 48 credit hours of instruction. Those who take the 44 programmed credits are entitled to a four-quarter-hour tuition adjustment.

Students taking the curriculum specified for the health sciences pay the standard tuition for each of their first three quarters, even though the academic work required in this curriculum is distributed over four consecutive quarters. Alternative Freshman-Year students in the health sciences curriculum are not charged additional tuition for their fourth quarter in residence and do not receive a tuition adjustment.

■ **Admissions**

For more information on the Alternative Freshman-Year Program, or to request an application, please write the Department of Undergraduate Admissions, 39 Richards Hall, or call 617-437-2000.

ROTC, Military Officers' Education Program

The Reserve Officers' Training Corps (ROTC) program, offered by the Department of Military Science, is an adjunct to University programs. The goal of ROTC is to develop students with leadership potential in their pursuit of an officer's commission in the military service of the United States. The program seeks to teach principles of personnel management and to inculcate the universal leadership traits of personal confidence, loyalty, ready acceptance of responsibility, and the desire to achieve.

To contact ROTC, write or call the Department of Military Science, 430 Parker Building, Northeastern University, Boston, MA 02115, 617-437-2372.

Army

Anthony J. Hoss, Lt. Col., U.S. Army, M.A., *Professor and Chairman,*
Department of Military Science

The Reserve Officers' Training Corps (ROTC) staff consists of active Army officers and noncommissioned officers assigned by the Department of the Army.

■ The Program

The program consists of the Basic Course (freshman and sophomore years) and the Advanced Course (middler, junior, and senior years). It does not conflict with co-op schedules.

Enrollment in the Basic Course is voluntary and is open to all full-time students who are United States citizens. Students in the Basic Course do not incur a military obligation.

The Advanced Course is open to all qualified students who meet these prerequisites: completion of the Basic Course (or approved equivalent), or prior honorable military service; physical aptitude and medical requirements; and age requirements. Advanced Course students receive a \$100-per-month stipend, up to \$1,000 per year. They are also paid for the six-week advanced camp normally attended between their junior and senior years. Participation in and completion of the program can lead to an officer's commission in the U.S. Army, Army National Guard, or U.S. Army Reserve.

■ Graduation Requirements

Regulations of the individual Basic Colleges prevail for ROTC graduation credit. Students may individually petition their academic department for acceptance of certain courses for graduation credit.

■ Scholarships

The Army ROTC scholarship pays 80 percent of the student's tuition and provides an allowance for textbooks and laboratory fees, plus an additional living allowance of \$100 per month, up to \$1,000 for each year the scholarship is in effect. Scholarships are available in varying lengths and cover the cadet's remaining academic years. Full-time students meeting specific requirements may apply for scholarships covering their last four, three, or two academic years. These are merit-based scholarships, and a student's earnings during cooperative work periods do not reduce scholarship payments.

■ Transfer Students and Veterans

Transfer students, whether or not previously enrolled in ROTC, are welcome to join the program. They should contact the Department of Military Science concerning their options for program enrollment.

Honorably discharged veterans (enlisted) are a vital part of our cadet corps and will receive special consideration for ROTC enrollment.

■ Uniforms and Equipment

Uniforms are issued without cost to ROTC cadets. A \$35 deposit is required to ensure the return of the loaned property in good condition. Any loss or damage exceeding the deposit will be charged to the student.

Air Force

James L. Frey, Lt. Col., U.S. Air Force, M.P.A., *Professor and Chairman,*
Department of Aerospace Studies, Boston University

The Air Force Reserve Officers' Training Corps (AFROTC) program offers students an opportunity to earn a commission in the United States Air Force. The student is commissioned as a second lieutenant upon completion of both the Aerospace Studies (AS) curriculum and the requirements for an undergraduate or graduate degree. AFROTC classes and leadership laboratories are conducted on the Boston University campus at 118 Bay State Road. For more information, telephone 617-353-4705 or write AFROTC at the campus address (Boston 02215-1796).

■ The Programs

Four-Year Program Northeastern University students may enter the AFROTC program as members of either a four-year or a two-year program. Participation in AFROTC by nonscholarship students during the first two years of the four-year program carries no commitment to serve in the Air Force.

Undergraduates may join the four-year AFROTC program by registering for the appropriate aerospace studies classes. Students from all academic disciplines, including five-year co-op, may register. Preferred entry is the first quarter of the first year, although students may enter as late as November of the sophomore year.

Freshman-year classes focus on the functions and organizations of the Air Force. Sophomore classes concentrate on military history with an emphasis on the use of airpower. Junior classes learn about management techniques and styles. Senior-year classes study international relations and the impact policies have on the defense establishment. Complementing the academic classes is a weekly leadership laboratory, during which students are introduced to Air Force customs, courtesies, drill, ceremonies, and lifestyles. The Air Force uniform and AFROTC books are provided to the student free of charge except for a refundable uniform deposit.

The nonflying commissioned graduate incurs a four-year active duty service commitment. Navigators incur a six-year post-training commitment, and pilots incur a ten-year post-training commitment.

Two-Year Program Students unable to participate in the four-year AFROTC program are eligible for the two-year program. Prerequisites for entry into the two-year program include at least six remaining academic quarters of undergraduate or graduate study, meeting Air Force physical standards, good moral character, and successful completion of six weeks of field training. Applications for the two-year program require several months for processing. Prospective two-year program

members should contact the University AFROTC detachment no later than December of the sophomore year.

■ **Graduation Requirements**

Regulations of the individual Basic Colleges prevail for ROTC graduation credit. However, students may individually petition their academic department for acceptance of certain courses for graduation credit.

■ **Scholarships**

Two programs are available: the Four-Year Scholarship Program and the College Scholarship Program. High school seniors may apply for the Four-Year Scholarship Program after March 1 of their junior-senior summer through a local Air Force Recruiter. Deadline for the completed package is December 1. The College Scholarship Program is available to freshmen and sophomore students. To be eligible for 3½-, 3-, 2½-, or 2-year scholarships, students must attend AFROTC classes in the fall quarter of their freshman year. Students who are unable to attend AFROTC in the fall quarter, freshman year are eligible for two-year scholarships. For more information, contact the Department of Aerospace Studies, Boston University, 118 Bay State Road, Boston, MA 02215, 617-353-4705.

Navy

Michael E. Field, Captain, U.S. Navy, M.A., *Professor and Chairman*
Department of Naval Science, Boston University

The Naval Reserve Officers' Training Corps (NROTC) Nurse program, through instruction in various subjects in naval science and exposure to operating elements of the Navy and Marine Corps, provides an opportunity for a commission as a naval officer in the Nurse Corps.

Anyone wishing to contact NROTC should write to or call the office of the Commanding Officer, NROTC Unit, Boston University, 116 Bay State Road, Boston, MA 02215-1796, 617-353-4232/2535.

■ **The Programs**

Nursing students at Northeastern may enroll in the NROTC Nurse program with the Department of Naval Science at Boston University. NROTC has two basic programs: the Scholarship Program (*see* Scholarships on page 181) and the College Program. The College Program provides students with naval science texts, uniforms, and a \$100 per month stipend during the last two academic years. Full-tuition scholarships may be awarded to selected applicants who have been active in the College Program for at least one semester. Applications for the College Program are made through the Department of Naval Science at Boston University.

Five-Year Co-op Students on a five-year co-op program may accept and use a Navy scholarship. Tuition is paid during those quarters when the student is actually in classes at Northeastern, and progression through the program of naval science courses is determined by completion of academic and professional requirements.

The NROTC Nurse program requires some professional training, depending on the program and the time of entry. This training occurs during summer "cruises" at navy hospitals. Normally, there are three "cruises" of four to six weeks each for scholarship students, and one "cruise" of four to six weeks for College Program students.

Two-Year Program A two-year program is available for sophomores/middlers who did not join NROTC by the start of their sophomore year. Students are sent to Navy summer school in Newport, Rhode Island, at full midshipman's pay and allowances, to catch up in the naval science courses. Both Scholarship and College Program options are available; selection for this program takes place in the spring, and all applications must be submitted by late February of the sophomore year.

■ Eligibility Requirements

To be eligible for the Naval ROTC program, students must be all of these:

- a citizen of the United States;
- at least 17 years old and not more than 25 years old (27½ for College Program) by June 30 of the calendar year in which graduation and commissioning are anticipated. Applicants who have prior active duty military service may be eligible for age waivers up to a maximum of 48 months.
- physically qualified in accordance with the standards for entrance;
- enrolled in a program leading to a nursing baccalaureate degree.

■ Graduation Requirements

Regulations of the individual Basic Colleges prevail for ROTC graduation credit. However, students may individually petition their academic department for acceptance of certain courses for graduation credit. Upon graduation and completion of NROTC requirements, Scholarship students are obligated to serve on active duty for four years, College Program students for three years.

■ Course Requirements

The NROTC program encompasses the science of nautical matters and principles of leadership, both of which are vital to the art of being a naval officer. The program has three interactive and equally important aspects. The first consists of the academic major with subjects taught by the University. These subjects must include three quarters of English composition. The second aspect consists of the professional academic subjects taught by the Department of Naval Science. The third aspect consists of leadership laboratories (two hours a week during the school year), and indoctrination tours conducted at Navy/Marine Corps facilities.

All students in the NROTC Nurse program must take the following naval science courses prior to graduation:

Introduction to Naval Science
Seapower and Maritime Affairs
Leadership and Management I and II

These courses are taught by NROTC staff officers at Boston University. Northeastern NROTC students attend classes with midshipmen from Boston University and Boston College. Naval science classes are offered in the fall and winter quarters only.

■ Scholarships

The Scholarship Program provides full tuition, books and fees, and a \$100 per month stipend for four or two years of instruction at Northeastern University. These scholarships are granted as a result of annual nationwide competition.

■ Admission

Students should visit or call the Boston University Naval Science Department Office prior to registration day to initiate application procedures. Students beyond the first quarter of the freshman year, or simply those with questions should contact the office of the Commanding Officer. All inquiries will receive immediate attention.

Graduate and Professional Schools

Many students look forward to continuing their studies beyond the undergraduate level. The following graduate and professional schools of the University offer both day and evening degree programs.

■ Arts and Sciences

The master of arts degree may be earned in applied behavior analysis, economics, English, history, journalism, political science, sociology, social anthropology, and writing. The master of science degree is available in biology; chemistry; economic policy and planning; law, policy, and society (interdisciplinary program); mathematics; and physics.

The Master of Science in Health Science, the Master of Journalism (in news media management), the Master of Public Administration, and the Master of Technical and Professional Writing degrees are also offered. In addition, students may earn the certificate of advanced graduate study in literary study.

The doctor of philosophy degree is available in biology; chemistry; economics; English; law, policy, and society (interdisciplinary program); mathematics; physics; psychology; and sociology. An interdisciplinary master of science degree program in medical laboratory science with a concentration in clinical chemistry is also available.

Nondegree certificate programs are also available in technical writing, and writing. Most programs may be completed through either full- or part-time study.

■ Boston-Bouvé College of Human Development Professions

The master of science degree may be earned with specialization in counseling psychology, human resource counseling, rehabilitation counseling, clinical exercise physiology, speech-language pathology and audiology, or recreation, sport, and fitness management. Graduate programs in the Boston-Bouvé College of Human Development Professions may be completed through full- or part-time study.

The master of education degree may be earned with specialization in consulting teacher of reading, curriculum and instruction, educational research, human development, special education, school counseling, school adjustment counseling, and college student personnel counseling. The certificate of advanced graduate study is offered in the areas of counseling psychology, human services specialist, school psychology, and rehabilitation counseling. The doctor of education degree may be earned in counseling psychology.

■ Business Administration

A master of business administration degree may be earned through any one of five M.B.A. programs. The Graduate School of Business Administration offers a variety of programs to meet the needs and schedules of graduate business students. Two full-time program alternatives are offered: the 21-month Cooperative Education M.B.A. Program, which includes a six-month, paid professional work assignment; or the two-year, traditional full-time M.B.A. program, which may include administrative, research, or teaching assistantship opportunities.

Individuals who wish to continue their full-time job responsibilities while earning an M.B.A. degree may consider the evening part-time M.B.A. program of study, the 18-month Executive M.B.A. program for upper-level managers, or the accelerated part-time High-Technology M.B.A. program for qualified technical professionals.

In addition, for individuals who already hold M.B.A. degrees, there is a nondegree program for advanced study in business administration leading to the Certificate of Advanced Study in Business Administration.

Center for Management Development The College of Business Administration sponsors the Center for Management Development, which provides opportunities for professional growth for middle and senior-level managers. The programs, scheduled throughout the academic year, include the Executive Development Program, the Management Workshops, and custom-designed programs. Participants are sponsored by their employers.

The Executive Development Program is a graduate-level course for managers who have had responsibility for a major task, function, department, division, or independent enterprise. The Management Workshops offer middle-level managers comprehensive study in major areas of business through two different graduate-level programs. The center also offers custom corporate in-house management education programs for a wide range of business organizations. For information, telephone 617-437-3272.

■ **Computer Science**

The College of Computer Science offers both full- and part-time programs leading to M.S. and Ph.D. degrees. Students may specialize in theory, databases, artificial intelligence, programming languages, operating systems, or communications and networks.

■ **Criminal Justice**

The College of Criminal Justice offers both full- and part-time programs leading to a degree of Master of Science in Criminal Justice. Students enrolled in the master of science program in criminal justice may choose from among several areas of specialization: administration and planning; criminology and research; security administration; and a multidisciplinary concentration developed with a faculty member to suit the individual's needs.

■ **Engineering**

The master of science degree may be earned, with specification in the field of chemical engineering, civil engineering, computer systems engineering, electrical engineering, industrial engineering, engineering management, information systems, or mechanical engineering. A special five-year honors program in mechanical, industrial, or electrical engineering is offered, leading to both bachelor's and master's degrees; the professional engineer degree in mechanical, industrial, or electrical engineering; the doctor of engineering degree in chemical engineering; and the Ph.D. degree in chemical, civil, electrical, industrial, or mechanical engineering.

■ **Law**

The School of Law offers a full-time program of professional instruction leading to the degree of Juris Doctor (J.D.). It is fully accredited by the American Bar Association and is a member of the Association of American Law Schools. There are no courses for part-time or evening students.

Unique among American law schools, Northeastern's School of Law features cooperative legal education. Under this plan, each student works full-time at law for participating employers for four calendar quarters during his or her second and third years, alternating with equal periods of full-time coursework. This blending of academic study and practical legal work experience, after a traditional first year of intensive academic study, is designed to offer the best possible preparation for the

actual practice of law. Cooperating employers include large and small private firms, government agencies, legal assistance and public defender organizations, judges, unions, corporate law departments, and virtually every type of legal practitioner. Employers are located nationwide.

Because the school operates 12 months a year, students complete the program on the same schedule as do those in more traditional law schools.

■ **Nursing**

The Graduate School of Nursing offers a master of science degree with specialization in administration, community health, critical care, primary care, and psychiatric-mental health nursing. The 52 quarter-hour curriculum is designed so that students may pursue either full-time or part-time study. Full-time students may expect to complete the degree requirements in one calendar year. The master's program helps to prepare students for advanced nursing practice as clinical specialists, managers, and educators.

The Certificate of Advanced Study is offered in administration, community health, critical care, primary care, and psychiatric-mental health nursing for those who already hold an M.S. degree in nursing.

■ **Pharmacy and Allied Health Professions**

The master of science degree is offered on a part-time and full-time basis in biomedical science, hospital pharmacy, medical laboratory science, medicinal chemistry, pharmaceuticals, toxicology, and pharmacology. The Master of Health Professions is also offered with the following options: general, health policy, physician assistant, and regulatory toxicology.

The Ph.D. degree is offered in biomedical science with specialization in medical laboratory science, medicinal chemistry, pharmaceuticals, pharmacology, and toxicology. The clinically oriented Doctor of Pharmacy (Pharm.D.) is offered as a full-time program to graduates of accredited colleges of pharmacy.

Six nondegree options are also available, with certificates in cardiovascular technology, health record administration, medical technology, perfusion technology, physician assistant, and respiratory therapy.

■ **Professional Accounting**

The Graduate School of Professional Accounting is specifically designed for the Arts and Sciences undergraduate interested in a comprehensive business education and an entry to the financial community. It is a 15-month program in which students are assigned to a paid internship with an international CPA firm as part of their curriculum.

Graduates of the program have had a nearly 100 percent placement rate, unparalleled success on the CPA exam, and have gone on to become presidents and chief financial officers of major corporations, as well as partners in the accounting profession.

Academic Research

Research is vital to a college education. Through research, faculty members and students stay abreast of developments in their particular fields. Faculty who disseminate this knowledge through publishing, speaking, and teaching help ensure that students receive a first-rate university education.

At Northeastern, research and scholarly endeavors are actively encouraged. Each year, the faculty receive funding for an ever-increasing number of research projects. Sponsorship comes from a variety of sources, including federal agencies, private industry and foundations, and the University itself.

While much of this research is carried out by faculty members, graduate students, and research associates, ample opportunities exist for undergraduate students. Research participation can be included as part of regular academic programs, as independent studies, or as cooperative work assignments. Research activities are limited only by the student's motivation, curiosity, and creativity.

Northeastern has numerous distinguished faculty members, many of whom have received prestigious awards, including Sloan Scholarships, Guggenheim Fellowships, and National Institutes of Health Research Career Awards. Many faculty also serve as consultants to government, business, and industry. At the same time, students will always find an enthusiastic and accessible faculty to answer questions, solve problems, and stimulate inquiring minds.

Current research spans almost every academic and professional field and is not limited to laboratory investigations or the hard sciences. Every department of every college at Northeastern carries out some basic or applied research projects.

A brief summary of some of the topics currently under investigation by faculty and students follows. Students desiring to explore the opportunities for research participation should inquire at the appropriate departmental offices.

■ Arts and Sciences

In the College of Arts and Sciences, research projects reflect the diversity of the college's 19 departments. Research includes such diverse topics as Chinese social sciences, plant molecular biology, nature in twentieth-century American poetry, visual attention and color vision, electromagnetism, human capital, optical emission spectroscopy, and the impact of the social policy of deinstitutionalization on children's services. The college's interdisciplinary interest in marine sciences is represented by the Marine Science Center, where faculty and graduate students conduct research in marine biology, botany, ecology, chemistry, and geology.

■ Boston-Bouvé

Research in the Boston-Bouvé College of Human Development Professions is broad in range and diverse in approach. Current research interests include the communication abilities of normal and hearing-impaired individuals, the role of exercise in cardiovascular health and disease, the evaluation of educational practices in the schools, an examination of interdisciplinary approaches to services for the elderly, and an investigation of rehabilitation services for the handicapped in industry.

■ Business Administration

Research in the College of Business Administration is partitioned between the theoretical and practical aspects of accounting, finance, management science,

general management, human resources, and marketing. New approaches in corporate practice and academic theory are being realized through conclusions reached by a faculty examining such topics as high-technology management, small-business entrepreneurship, and foreign investment in developing countries. Other studies concentrate on transportation problems in the United States, government regulation in industry, and technological forecasting in the high-technology industry. Significant work is also being done by the marketing faculty in the area of survey research.

■ **Computer Science**

The College of Computer Science represents one of today's most active technological fields. Research interests of the faculty include artificial intelligence (expert systems, connectionist models, and pattern recognition), theory (cryptography, complexity, and analysis of algorithms), programming languages and systems, computer networks, and graphics and image processing. Interdisciplinary activities include the Biological Knowledge Laboratory, where research is concerned with building a "scientist's assistant" for biologists that will eventually be able to read and summarize the scientific literature, and a project in artificial intelligence and law.

■ **Criminal Justice**

The College of Criminal Justice stresses both theoretical and applied research. Lawyers, statisticians, social and behavioral scientists, and systems specialists all serve on the faculty and participate in numerous research activities. Some research directions currently pursued by faculty include juvenile delinquency, contemporary police systems, private security, terrorism, legal studies, and crime victims.

■ **Engineering**

Research in the College of Engineering encompasses some of today's most important technological subjects. Robotics, telecommunications, signal processing, electromagnetics, materials, science and engineering, geomechanics, water quality management, applications of biotechnology, and theoretical aspects of computer engineering and computer-aided design are some of the major fields of interest within the college. Not all studies are high-technology oriented. Faculty pursue projects that range from the study of the electrical properties of human blood vessels to the development of methods for treating toxic waste waters. These seemingly diverse research areas all attempt to improve the quality of life.

■ **Law**

The School of Law's research activities focus on an investigation of the operation and impact of the legal system from a variety of interdisciplinary perspectives—including those of the historian, the economist, the social theorist, and the political scientist. Other research focuses on current legal issues, the problems of communicating lawyering skills, and the theory and practice of supervision.

■ **Nursing**

Research in the College of Nursing is directed toward clinical problems, the student population, and the community at large. Other significant interests include cooperative education, women, the elderly, development of leadership skills in nurses in middle-management positions, and adaptation to chronic illness.

■ **Pharmacy and Allied Health Professions**

Research in the College of Pharmacy and Allied Health Professions includes new ways to analyze antidepressant and anticonvulsant drugs, the study of the pharmacology of benzodiazepine tolerance and dependence, the monitoring of electrophysio-

logical responses of neurons, the development of resistance to drugs and metals by bacteria, the detection of bacteria and viruses in ocean waters, the development of new antihypertensive drug therapies, the development of novel drug delivery systems, and the design of protocols to improve the survival of organ transplants. Other studies include review of current health policy laws and regulations, theoretical and practical aspects of health information management, and job and role delineation. Among the sponsors of the college's work are the National Institutes of Health, the Office of Naval Research, Eli Lilly Co., the American Heart Association, and the American Diabetes Association.

■ Research Centers and Institutes

Northeastern has several interdisciplinary centers and institutes that do not grant degrees but engage in a variety of research studies in collaboration with academic departments. Support services for research are provided by the University's Division of Research Management, the Division of Academic Computing, and the Division of Laboratory Animal Medicine, and through the collections, reference, and online search services of the University libraries.

Barnett Institute of Chemical Analysis and Materials Science The Barnett Institute of Chemical Analysis and Materials Science is concerned with basic research in analytical chemistry and materials science and with applications to problems of social relevance. The institute has developed an international reputation in the fields of separation science, mass spectrometry, amorphous metals, and biochemical analysis. For more information, contact Dr. Barry L. Karger, director and professor of chemistry, at 617-437-2826.

Center for Applied Social Research The Center for Applied Social Research deals with issues of public policy and social research on an interdisciplinary basis. Projects are under way in criminal justice, public safety, social welfare, and education. For more information, contact the director, Glenn L. Pierce, at 617-437-3310.

Center for Asian Studies The Center for Asian Studies was established to encourage, develop, and promote teaching and research on Asian life, and to promote the educational and cultural exchange of students and scholars. The center develops and supports multidisciplinary academic programs, courses, and research on individual Asian countries, the region as a whole, or specific issues applicable to Asian life, such as Asian political processes or family life in Japan. It supports scholarly research, faculty, and visiting scholars; coordination of graduate and undergraduate courses to develop academic and professional interest; and acquisition, publication, and dissemination of research findings on topics selected to advance scholarship and knowledge about Asia. The center also encourages and sponsors seminars, symposia, and conferences on related issues. For more information, contact Dr. Holly M. Carter, director and associate professor of African-American studies, at 617-437-4153.

Center for Biotechnology Engineering The center seeks innovative solutions to societal problems in which bioprocessing plays a key role. Current interest areas include synthesis of biopolymers for controlled-release drug delivery systems, use of bioconversion processes for detoxification of hazardous wastes, and development of biosensors for advanced instrumentation systems. For more information, contact Dr. Donald L. Wise, director and Cabot Professor of Chemical Engineering, at 617-437-2992.

Center for Cooperative Education The Center for Cooperative Education helps organizations explore the concept of cooperative education, implement new programs, or expand existing programs. It offers short-term training programs for coordinators of

co-op programs and provides technical assistance to and evaluations of cooperative education programs for both educational institutions and employers. The center also handles special projects for the Division of Cooperative Education and other University organizations. For more information, contact Dr. Joseph E. Barbeau, director, at 617-437-3463.

Center for Digital Signal Processing The Center for Digital Signal Processing addresses state-of-the-art hardware and software systems designed to encode, decode, and extract sophisticated information from data originating from a variety of applications ranging from radar to electrocardiograms. For more information, contact Dr. Bahram Jhafai, director and associate professor of electrical and computer engineering, at 617-437-2984.

Center for Electromagnetics Research The Center for Electromagnetics Research, a National Science Foundation-sponsored cooperative research center, is concerned with advanced training and research in such areas as radio-frequency and electrical-discharge phenomena, electro-optics, plasmas, materials, integrated circuits, and computers that are of importance to the electronics and aerospace industries. The center's activities are supported by the federal government and industrial sponsors. For more information, contact Dr. Michael B. Silevitch, director and professor of electrical and computer engineering, at 617-437-5110.

Center for Labor Market Studies Research in the Center for Labor Market Studies is concerned with employment, training, welfare, and human resource issues. The center is recognized as an important regional and national resource for information about educational practices and employment patterns. For more information, contact Andrew M. Sum, director and professor of economics, at 617-437-2242.

Center for Technology Management The center is a research organization focused on technology management issues, including advanced information systems and new product development in technology-based industries. For more information, contact Dr. Kathleen F. Curley, administrative director and professor of management science, at 617-437-5052.

Cooperative Education Research Center The Cooperative Education Research Center performs research in cooperative education and responds to the information needs of the co-op community across the country. Numerous studies are under way, and the center maintains a large database of current information about co-op programs and serves as a clearinghouse for publications about co-op. For more information, contact Dr. Joseph E. Barbeau, director, at 617-437-3780.

Electron Microscopy Center The Electron Microscopy Center has up-to-date scientific equipment to support training and research activities in cellular and subcellular structures. For more information, contact Dr. Daniel C. Scheirer, director and professor of biology, at 617-437-2256.

Marine Science Center The Marine Science Center, located in Nahant, Massachusetts, is the only marine station with a year-round research and teaching facility located on the New England coast north of Cape Cod. The projects carried out there focus on marine ecology, behavior, neurobiology, structural biology, biochemistry, and molecular biology. Its exposed, rocky shore provides a living laboratory for the study of marine animals. For more information, contact Dr. Kenneth B. Sebens, director and professor of biology, at 617-581-7370.

Resources, Services, and Activities

University Libraries



Alan R. Benenfeld, M.S., *Dean and Director*

Together, the collections, services, staff, and facilities of the Northeastern University Libraries provide access to information and an understanding of the organization of the literature and other information resources of the academic disciplines. The library is integral to the academic and research processes, whether these occur in a formal classroom, seminar, or laboratory setting or through individual study and enrichment.

■ Libraries

The University Libraries include four facilities. On the Boston campus, the newly constructed Snell Library supports the University's undergraduate, graduate, and research programs. A five-level structure, it has 2,800 seats and shelving for more than 1.25 million volumes. In addition, three libraries support the academic programs at the Burlington and Dedham campuses and the research program at the Marine Science Center in Nahant. Library services incorporate online, telecommuni-

cation, and media technologies associated with information resources, including an online catalog and circulation system, microcomputer and language laboratories, and a CD-ROM optical disc network.

■ Collections

The total holdings of the University Libraries include more than 650,000 volumes, 1,500,000 microforms, current subscriptions to over 7,000 serials and newspapers, and 15,000 audiovisual and computer software titles. There is a large reference and government documents collection in Snell Library as well as reference materials in each of the satellite campus libraries. The collections also include materials such as technical reports, music scores, maps, and CD-ROM optical disc databases.

Snell Library is a federal depository with more than 250,000 government documents, reports, and other publications made available through the U.S. Government Printing Office. It specializes in collecting publications of the U.S. Congress, census materials, Justice Department documents, business and economics publications of the Commerce Department, and the reports of independent and Presidential commissions. The library also collects United Nations and UNESCO documents and, increasingly, state and local documents.

The André F. Favat Center has curriculum development materials for elementary and secondary school education and a fine children's literature collection.

The Media Center houses a collection of computer software, audio, and video materials. Facilities are provided for viewing and listening to discs, cassettes, and tapes, as well as for using interactive video resources. A language laboratory supports the study of modern foreign languages and of English as a second language. The center also has a computer that translates the printed page into the spoken word for the visually impaired, and several talking-book machines.

The University Archives serves as a repository for the historical records of the University. The collection also includes faculty publications, student yearbooks, Northeastern dissertations and theses, and other University publications.

■ Services

Librarians provide reference assistance as well as instruction to groups and individuals on the bibliographic research process and on strategies for identifying, locating, and using information resources. Each quarter, a series of tutorials is offered giving students further opportunities to meet with a librarian to discuss particular or specialized research needs.

The library has an online system that automates many of its services and operations. An online catalog of most of the library's holdings is linked with an online circulation system so that the display shows whether a particular book is currently charged out from the library.

The online catalog is the primary database on the publicly accessible Northeastern University Libraries Information System (NULIS). Other databases are being added to NULIS, among which are indexes to the contents of periodicals and newspapers. In addition, NULIS serves as the Library's prime gateway to other networked information resources, including the catalogs of other libraries. NULIS is accessible from more than 60 terminals located on all floors of Snell Library as well as in each satellite campus library. The online catalog and most other NULIS databases are also accessible through the University's academic computing network. Any user with access to this network from an office, laboratory, or dormitory on campus, or—through dial-in capability— from an off-campus site, is able to search the information resources available on NULIS.

Snell Library has a 17-station CD-ROM optical disc network supporting the searching of each of 12 databases. This network allows users to search subject indexes and abstracts to journal articles, government documents, research reports, and financial data. Older backfiles for some of the larger CD-ROM databases are accessible at several non-networked stand-alone stations. For complex searches, or for the most current or the most comprehensive searches, the library also offers a fee-based Computer Search Service that provides online retrieval of information from more than 300 specialized databases; a librarian can advise on the cost of this service.

If a title is not in the University's collections, each library has available for consultation union lists of serials and other print and online research aids that serve as guides to collections in other libraries, both in the greater Boston area and beyond. In addition, reference librarians can assist users in identifying area and other libraries that own a particular title. Interlibrary loan services are available to faculty and graduate students and, under certain conditions, to undergraduates.

Students may use three laboratories in Snell Library equipped with more than 100 microcomputers with general-purpose programming language, word processing, spreadsheet, and database software. About 500 of the study carrels located throughout the library are linked to the University's academic computing network, so that users who wish to bring their own portable computers can access any other computing resource available to them through this network.

The Media Center coordinates a peer tutoring program for students in all subjects. Tutoring services are arranged by appointment and are free of charge.

The Media Production Laboratory is a self-service facility with staff available to train and aid students and faculty in creating presentational media products such as slides and overhead transparencies.

A series of publications is prepared by the library staff to acquaint students with the services and collections in the University Libraries and to help students with their research. These include a general *Guide to Northeastern University Libraries*, and short guides to services such as the online catalog and CD-ROM, to types of resources such as encyclopedias and periodicals, to resources in particular disciplines such as economics and nursing, and to specific subjects such as science fiction and Caribbean music.

■ Boston Library Consortium

Northeastern University is a member of the Boston Library Consortium, a cooperative arrangement among the following academic and research institutions: Boston College, Boston Public Library, Boston University, Brandeis University, the Massachusetts Institute of Technology, Northeastern University, the State Library of Massachusetts, Tufts University, the University of Massachusetts (Amherst and Boston campuses), and Wellesley College. The University's membership in the Boston Library Consortium generally allows for on-site use by, but does not grant borrowing privileges to, students at Northeastern. Some of the consortium libraries and many other libraries in the Boston area require that a visiting student present a special pass or letter of introduction. A Northeastern reference librarian can advise about such student visitor policies.

Academic Assistance Center

Canla B. Oblas, M.A., *Acting Director*

The Academic Assistance Center (on the Fenway) offers free tutoring services to Northeastern students. Graduate and upperclass students serve as tutors, providing individual or small-group review in most subjects. At the center's Reading Lab, students can receive professional assistance in reading, vocabulary, notetaking, test preparation, and related reading and study skills. Referrals to other University assistance facilities (the Writing Center, the Math Center, Counseling and Testing, and the Disability Resource Center) are made as appropriate. The center is open from 8:30 A.M. to 4:30 P.M. Monday through Friday. For more information, telephone the Academic Assistance Center at 617-437-2328.

Academic Computing

Glenn L. Pierce, Ph.D., *Director of Academic Computing*

Academic Computing (AC) facilitates the use of computers by Northeastern students and faculty. Some years ago that meant maintaining one good-sized computer, used primarily by those doing advanced work in engineering, mathematics, or the physical or biological sciences. More recently, computing has found productive use in nearly every field of study at the University. At the same time, computing activities have increasingly migrated to personal computers, altering the nature of the need for computing services. The AC staff is committed to meeting these new challenges while continuing to support the traditional, computationally intensive uses of computing.

The AC center's Personal Computing Initiative supports personal computing with negotiated discounts on hardware and software (available through the Northeastern Computer Store) and with advice, training, and assistance on personal computer use. The goal is to create an environment as hospitable and supportive as possible to the personal mode of computing.

Academic Computing and its Information Technology Resource Center (ITRC), supervised by Le Baron Briggs, maintain the *lynx* communication system for the exchange of computer mail and conference discussions. Participation in *lynx* is available to any member of the Northeastern community and is free. To sign up for a *lynx* account, bring a valid Northeastern I.D. to 39 Richards Hall during business hours.

The ITRC also maintains multi-user computing systems for general university use, an advanced high-speed data network for computer communication both inside the university and with other institutions, and numerous student computing labs on the Boston, Dedham, Burlington, and Liberty Square campuses. *ACCESS*, the newsletter of the division, includes the locations, schedules, and facilities of the labs as well as other news about computing at Northeastern.

Alumni Association

More than 114,000 alumni form the Alumni Association, created to benefit Northeastern and its graduates. The association is governed by an executive committee elected from the alumni community. Membership is automatic upon graduation. Association activities include Homecoming, presentation of the Outstanding Alumni Awards, and the annual presentation of Professional Promise Awards to outstanding seniors in each college. Notice of all association activities is published in the *Northeastern Magazine* and in other specialized publications.

Regional alumni clubs have been established from coast to coast. All alumni are eligible to join these organizations. The clubs meet periodically. Programs are varied

and are often presented in conjunction with professional and athletic events, faculty visits, and service projects. Alumni class organizations also conduct class reunions every five years; and Golden Graduates' Day, for senior alumni, has become an annual event.

The association sponsors and assists constituent organizations that focus on common professional and avocational interests and college affiliations. These groups have their own officers and conduct various programs throughout the year.

Regional alumni clubs provide a valuable service to the University by sponsoring admissions conferences for high school students and the parents of students who are interested in attending college. Alumni volunteers across the nation represent the Admissions Office on a continuing basis at high schools and community colleges.

The association is headquartered in the Office of Alumni Relations, 125 Richards Hall, 617-437-3186. Addresses of alumni are maintained in the Office of Alumni Records, 617-437-2791.

Center for the Study of Sport in Society

Richard Lapchick, Ph.D., *Director*

This center, the first of its kind, was founded to address issues of academics and athletics. It has established a university degree completion program for current or former professional athletes and former student-athletes whose eligibility expired before they obtained a degree. The center is the hub of the 70-member National Consortium for Academics and Sport. More than 2,000 athletes have returned to participate in the degree completion programs of the consortium.

More than 535,000 students, parents, teachers, and coaches have been reached by athletes who have participated in the center's Community and School Outreach Program. The center and the consortium sponsor National Student-Athlete Day, with events in all 50 states. The center sponsors seminars and a broad-based curriculum in sport and social issues, gives annual awards for excellence in sports journalism, and promotes campus-wide lectures, forums, and news conferences. Two journals are published through the center: the *Journal of Sport and Social Issues* and the *CSSS Digest*.

Project TEAMWORK, funded by a \$750,000 grant from the Reebok Foundation, is a three-year national initiative demonstrating how the principles of TEAMWORK can lead to a greater racial, ethnic, and human rights sensitivity. The professionally trained multiracial "TEAM," consisting of Luis Tiant, Norm Van Lier, Robert Weathers, Holly Metcalf, and Bob McCabe, speaks to young people about their experiences with human rights and TEAMWORK, emphasizing that without sports they might never have come together. However, brought together by a sports team, they learned the shared values and aspirations of different racial groups.

The director of the program is an author, scholar, and civil rights activist. Keith Lee, a six-year veteran of the NFL, is the associate director. For more information about the center, call 617-437-5815.

Counseling and Testing Center

Judith A. Clementson, Ph.D., *Associate Dean and Director*

The Counseling and Testing Center provides a broad range of counseling services. These services include assistance in choosing an appropriate college major, career planning, resolving personal loss and life adjustment problems, developing satisfying interpersonal relationships, improving study skills, and dealing with difficult feel-

ings such as anxiety or depression. The center provides short-term counseling (12 sessions maximum); if longer-term treatment is needed, assistance is offered in the form of referrals and resources.

In addition to individual counseling, students may take psychological tests to increase their self-knowledge, join a group of students with whom they share concerns, use self-help tapes, or make use of the center's file of information about careers. There is no charge for these services for enrolled Northeastern students.

Department of Career Development and Placement

Carol S. Lyons, M.Ed., *Interim Dean and Director*

The Department of Career Development and Placement offers career guidance, counseling, and placement assistance to all students and alumni of the University. Job files are maintained and contacts are made with potential employers. The department helps students formulate career plans, prepare for entry into the work force, and find employment. This assistance is provided in the form of a variety of workshops (among which are résumé preparation, cover-letter writing, interviewing, and the job search) and undergraduate elective courses on career development topics. Courses are subject to normal tuition charges, but all other services are provided without charge except for a nominal fee for purchasing handouts.

This department houses the Career Resource Center, which contains a collection of up-to-date career literature and other materials, including career planning texts, annual reports, descriptive brochures, catalogs, and information on more than 1,200 organizations. A job bank of employment opportunities is updated daily. Individuals can apply directly for these opportunities. A collection of internship opportunities is also available in the center. Staff are available by appointment for individual career counseling, and on a walk-in basis for résumés, and cover-letter critiques.

Disability Resource Center

Ruth K. Bork, M.Ed., *Director*

Often, the degree of physical accessibility and types of available support services play an important part in a disabled student's selection of a college. Northeastern's physical plant and support services render it doubly accessible.

Northeastern's buildings are relatively close to one another. Nearly all of them have elevators open to use by everyone. Of special advantage is the tunnel system that links most buildings. During inclement weather and throughout the harsh New England winter, this proves a universally welcome feature.

Any student who has a disability-related special need—no matter how small or individual—receives ready support services from the Disability Resource Center (DRC). Disabled students are therefore strongly urged to meet with the center's staff early in their consideration of Northeastern—to discuss services available and to experience the campus firsthand.

To avoid unnecessary delays or confusion caused by last-minute adjustments, visitors should contact the DRC director for assistance. (See the end of this section.) The following types of assistance are available:

Counseling Personal, academic, and referral services.

For Deaf/Hard of Hearing Students Academic services include oral and sign language interpreters, note takers, TTYs (all key departments), and audio loops. Dormitories have visual fire alarms. The Speech and Hearing Clinic provides speech therapy,

audiometric testing, and hearing-aid evaluation, fitting, and orientation. Sign language classes are available through the American Sign Language Program (see page 84). *Sign language interpreting and oral interpreting services will be provided to deaf and hard-of-hearing students only after they have been denied such services by their Division of Vocational Rehabilitation, provided the Disability Resource Center has received information documenting the reason for such denial.*

General Assistance Services include counseling, scribes, advocacy liaison with instructors and other University staff, handicapped parking, and alternative examinations.

Housing Assistance with accommodations and/or modification in residence halls.

Information Clearinghouse This clearinghouse offers articles, periodicals, books, and other literature for, about, and by individuals with disabilities.

For Learning Disabled Students The center assists in securing taped textbooks and materials, readers, untimed testing, and course and program modification. Services will be provided only upon receipt of diagnostic testing, documentation, and prescriptive write-ups. The WAIS-R and WISC-R are not accepted as documentation of a learning disability. Students without this material can be referred to appropriate agencies for testing.

Orientation Tailored to the needs of specific disability groups, orientation uses tactile maps for vision-impaired students, interpreters for deaf/hard-of-hearing students, and accessible routes of travel for students with mobility impairments.

Registration and Preregistration Assistance to help ensure class accessibility.

For the Visually Impaired The center assists in securing taped and braille textbooks and materials; readers; campus orientation; tactile maps; and auxiliary aids such as brailers, Visualtek readers, raised-line drawing kits, large-print typewriters, talking-book machines, magnifiers, talking calculators, adapted computers, variable-speed tape recorders, and the Kurzweil Reading Machine.

For Wheelchair Users/Mobility-Impaired Students The center offers information on appropriate routes of travel, assistance in relocating classes, adaptive physical education, and physical therapy.

The DRC is also the gathering place for the Disabled Student Organization of Northeastern University and the Northeastern University Deaf Club, which work cooperatively with the center to plan programs and improve accessibility of services. For more information or assistance, contact the Disability Resource Center at 4 Ell Building, 617-437-2675 (voice) or 617-437-2730 (TTY).

English Language Center

Paul C. Krueger, Ed.D., *Director*

The English Language Center is an important resource for international students at Northeastern. Its goal is to ensure that students who speak English as a second language are proficient enough to carry on full-time studies in any degree program without language-related problems.

The center administers the Intensive English Program, which offers three levels of intensive noncredit courses in English as a second language—beginning, intermediate, and advanced. Intensive English classes are open to undergraduate and graduate students as well as to students who come to Northeastern to study English only. With the approval of the center's director, students also admitted to a degree

program may take courses for credit while studying advanced Intensive English.

The Intensive English Program offers 20 hours of classroom instruction per week and a number of special services. The weekly program includes classes in English structure, reading, writing, listening, and speaking skills; small-group tutorials; practice in a language laboratory and in a writing laboratory; and help from a pronunciation specialist. Staff work closely with the International Student Office, other offices in Student Affairs, the academic departments, and other University services.

The English Language Center also provides advice and consultation services to the Northeastern community at large. Center staff are available to answer questions from teachers, administrators, and students and can design special programs for special needs on short notice. For more information about the English Language Center, telephone 617-437-2455.

Hearing, Language, and Speech Center

The Hearing, Language, and Speech Center is the setting for graduate students' early training. Under close observation by clinical supervisors and faculty, students may gain skills essential to progress to a second level of experience at local off-campus affiliations. The center has been accredited by the Professional Services Board of the American Speech-Language-Hearing Association as meeting national standards for clinical facilities.

The center, located at 133 Forsyth Building, serves all members of the University community. Diagnostic evaluation and treatment are provided to clients who demonstrate a variety of communication disorders. Hours are Monday through Friday, 8:30 A.M. to 4:30 P.M. Telephone 617-437-2492.

HELP Legal Services

The HELP Legal Services Plan offers free consultations and low-cost legal services to all students. Complete confidentiality is assured. Services are available Monday through Friday, 10:00 A.M. to 5:00 P.M. For an appointment, telephone 617-437-2636 or stop by the office at 242 Ell Center.

International Student Office

Sally M. Heym, B.A., *Director*

The International Student Office (ISO) provides a wide variety of services for the more than two thousand foreign undergraduates, graduates, and faculty. Specific services range from advising international students on immigration regulations and academic, financial, and personal concerns to issuing forms and official documents for the transfer of funds from home or for travel outside the United States.

The ISO strives to promote cultural understanding between international and American students by presenting cross-cultural communication workshops, orientation programs, and quarterly newsletters. The ISO also acts as a liaison between the various departments and colleges and many public and private agencies concerned with the affairs of foreign nationals in the academic community.

The ISO works closely with the International Student Forum (ISF), an umbrella organization for the many different ethnic organizations on campus. The ISF is the center for many international student activities and sponsors such events as ski trips, dinners, picnics, and a week-long celebration in the spring.

Office of Freshman Affairs

Anthony J. Bajdek, M.A., *Associate Dean and Director*

The Office of Freshman Affairs monitors and facilitates the academic progress of freshmen by providing academic counseling and appropriate administrative action. It also applies academic policy, authorizes changes of major (both within and between colleges), prepares special course schedules for students who change their majors as well as for those with advanced placement or advanced standing credit, identifies freshmen with deficient academic records for academic probation, authorizes summer corrective work, and reenters eligible students at the freshman level as repeaters or continuing freshmen.

Midway through each academic quarter, a computer-based Interim Academic Status Report system, involving progress reports prepared by instructors of freshmen, provides detailed evaluations for use by students and the faculty who serve as their advisers. This evaluation is a preventive measure designed to help detect and assist potentially failing students and is managed by Freshman Affairs.

To support the academic progress of freshmen, the Office of Freshman Affairs coordinates the flow of academic information to the faculty who make up the advising system for freshmen and uses appropriate research to measure the success of specific academic support activities and academic programs designed to enhance the freshman year experiences.

During the year, the staff conducts special seminars designed to assist students identified as having difficulty. When freshmen complete the three academic quarters of their first year, the Office of Freshman Affairs reviews their academic records to determine eligibility for sophomore status.

In fulfilling its responsibilities, the office is not only an important central support service for freshmen, but also an advocate for the concerns of freshmen.

Office of Minority Student Affairs

Ella Robertson, M.Ed., *Director*

The Office of Minority Student Affairs was created in 1968 to respond to the special needs of minority students at Northeastern. Contact with minority students is established prior to registration, continues throughout the first academic year, and thereafter is maintained and encouraged as long as the student wishes.

The staff of the Office of Minority Student Affairs helps students in matters such as registration, course scheduling, program choice, and academic assistance, and is available for financial, social, and career counseling. The office is also a link between minority students and other departments within the University and assists in the resolution of problems with faculty, staff, or administrators.

The academic performance of all minority freshmen is monitored within the Office of Minority Student Affairs, which also determines whether a student is in good academic standing, should be placed on probation, or should be dismissed from the University. For more information about this office, telephone 617-437-2787.

Orientation Programs for New Students

Harvey Vetstein, Ed.D., *Associate Dean and Director*

Orientation is that time immediately preceding classes that is devoted to affording new students the opportunity to learn about Northeastern and to meet classmates, administrators, faculty members, and advisers. Orientation is planned and super-

vised by the Director of Orientation, who sees that students are introduced to the traditions and people that make up the University. At that time, registration, class schedules, and other procedures and details necessary for enrollment are completed.

In accordance with tradition, students are welcomed by the President at a special convocation. They also meet with deans and others who will have important roles in their college careers. Upperclass volunteers assist in setting up and running programs that provide opportunities for relaxation, recreation, and cultural enrichment. Members of the Dean of Students' staff are available during orientation and throughout the year to answer questions and provide assistance.

Preprofessional Advising

The Pre-Health Professions Advisory Committee offers preprofessional counseling for students interested in careers in medicine, dentistry, or related professional medical fields. Committee members are available to discuss the various medical fields, minimum admissions requirements, and the application process.

For students preparing for a career in law, several faculty members can serve as advisers and resource personnel on related curricular and admissions questions.

In addition, the Department of Graduate Placement Services provides information and advice on procedures for admission, preparation of applications, and the scheduling of appropriate admissions tests. For more information, contact a counselor through the Office of the Dean of Arts and Sciences, 400 Meserve Hall.

Public Safety Division

All students are urged to take full advantage of police, parking, fire safety, security, emergency medical and related public safety services offered by the University's Public Safety Division. Although the Public Safety Division provides 24-hour services every day of the year, students are reminded that—to minimize being victimized—each individual who lives, works, or studies in an urban environment is responsible for observing basic personal safety and security practices. The Public Safety Division provides assistance to individual students or groups upon request to identify potential security hazards and to help them plan personal safety programs.

Reading and Language Skills

Reading Clinic The Reading Clinic, located in Lake Hall, offers a wide range of diagnostic and corrective services for a variety of reading and language problems. It is open to persons of all ages, including University students. Faculty members are also qualified to administer such tests as the WAIS, WISC, Binet, ITPA, Bender, and most standardized instruments.

Related Services See also the Academic Assistance Center, page 193; Office of Freshman Affairs, page 198; the Counseling and Testing Center, page 194; and the English Language Center, page 196.

Religious Life Office

Northeastern University is concerned for the religious and moral development of students of all faiths. The Religious Advisory Board, consisting of administrators and faculty as well as chaplains, seeks to articulate the needs in this area and facilitate the work of various religious groups on campus.

The interfaith Chaplains' Association, consisting of chaplains and their assistants, works together on campus religious affairs. The chaplains also deal with students on a denominational basis at various centers near the campus: Episcopal College Work Center at 40 Prescott Street in Brookline; Hillel House at 456 Parker Street for Jewish students; Lutheran Center, 84 The Fenway #14; and St. Ann Roman Catholic Parish and Student Center at 68 St. Stephen Street.

Interfaith services to celebrate special days and events are held in the Bacon Memorial Chapel, located at 211 Ell Building. The chapel is also used for denominational worship services and special lectures on religion. It is open daily for prayer and meditation and is a setting for weddings of both students and alumni.

The Religious Life Office is located at 207 Ell Building and is open from 8:30 A.M. to 4:30 P.M., Monday through Friday, telephone 617-437-2728.

University Health Services/Lane Health Center

Bruce W. Lowney, M.D., F.A.C.S., *Director*

The Lane Health Center, 135 Forsyth, serves the health care needs of full-time University students. Physicians, laboratory, and radiology services are available Monday through Friday, 9:00 A.M. to 4:30 P.M. A registered nurse is on duty when the clinic is closed.

An emergency telephone number (617-437-2772) is answered by the nurse on duty, who will make appropriate arrangements for any urgent situation, nights, weekends, and holidays. All calls from students in University housing should be made through the Residence Life staff.

Clinics in gynecology, orthopedics, sports medicine, surgery, and mental health services have specific hours, and some require referral by a staff physician. Referral for services unavailable in the Health Center can be arranged by a staff physician.

An infirmary is also maintained to care for students living in University housing. These students pay an infirmary fee that entitles them to 20 days of infirmary care at no additional charge (except for special medications).

Students are required to have a record of physical examination on file at the Health Center. Failure to fulfill this requirement may result in an additional fee for a physical examination completed by a staff physician.

Massachusetts state law, Chapter 76, Section 15C, also known as the College Immunization Law, requires that, in order to register for classes, all full-time college students born since December 31, 1956, and all part-time undergraduates and graduates in the health sciences whose duties require patient contact must present evidence that they are immunized against measles, mumps, rubella, diphtheria, and tetanus. Effective August 1991 the law requires documentation of two measles vaccinations. (Medical and religious exemptions are allowed but must be documented. See Admissions, page 17, for more about measles documentation.)

Further, the University requires evidence of a positive titre for Hepatitis B for the following groups of students: all undergraduate students and graduate students deemed at risk by their departments in Boston-Bouv , Cardiopulmonary Sciences, Forsyth, Medical Laboratory Science, Nursing, Paramedic, Physician Assistant, and Radiologic Technology. The vaccine is available through the Health Center for an additional fee.

All full-time students are covered by a Blue Cross/Blue Shield policy that remains in effect from the day of initial registration until the first of the month following graduation, dismissal, or withdrawal from the University. The fee for this insurance may be waived if proof is shown of comparable coverage.

Activities



The University regards student activities as an integral part of education and encourages relaxation and socializing through a wide range of activities: from serving on Student Government to writing for *The Northeastern News*, broadcasting over WRBB, performing in the band, or participating in intramural sports. Students may make new friends by joining any of the more than 170 campus clubs and organizations; by attending a lecture, film, or play; or by skiing or camping in the mountains.

A good portion of between-class time will be spent in the Carl S. Ell Student Center, the dominant feature of which is the main lounge. Five stories in height, the spacious lounge is a comfortable place to meet, socialize, or study. Housed in the center are three food outlets: a cafeteria, Burger King, and Club Ell where free films and live entertainment are provided regularly. In addition, the Student Center has a ballroom; a large game room with billiards, table tennis, and video games; a typing room; a computer room; many meeting and function rooms; and student organization offices.

The Information Booth staff helps answer questions and offers printing and photocopying services.

Each Monday and Thursday between 11:30 A.M. and 1:30 P.M., no classes are scheduled and these time blocks are reserved for student activities. All students have the chance to become involved in campus activities.

Student Organizations

All-University Organizations

Council for University Programs (CUP)
Concert Committee
Lecture Committee
Publicity Committee
Special Events Committee
Homecoming Committee
Resident Student Association
Student Alumni Association
Student Government Association (SGA)
Student Orientation Staff (SOS)

Departmental and Academic Organizations

Advertising Club
Art and Architecture Society
Association of the U.S. Army
Beta Biology Club
Biomedical Engineering Society
Black Business Student Association
Black Engineering Student Society
Computer Association
Criminal Justice Advisory Council
Economics Club
Educational Council
Fenway Project
Human Resource Management Club
Human Services Student Organization
International Students, College
of Pharmacy and Allied
Health Professions
Linguistics Society
Manufacturing Club
Math Club
Medical Laboratory Science Club
Musicians' Society
Naval Science Association
Nursing Student Organization Council
Optical Society of America
Peers Reaching Out
Pershing Rifles
Philosophy Club
Physical Therapy Club
Physical Therapy Yearbook
Psychology Club
Public Relations Student Society
Respiratory Therapy Club
The Script (Pharmacy yearbook)
Society of Physics Students
Speech and Hearing Club
Student Athletic Training Association
Student Health Records Association
Terra Society
Transportation and Logistics Club
United Nations Association

Ethnic and Cultural Clubs

African Student Association
Arab Heritage Cultural Club
Armenian Club
Asian-American Student Association
Cambodian Student Association
Cape Verdean Students Organization
Caribbean Student Organization
Chinese Student Club
Haitian Student Unity
Hellenic Association
Indian Culture Group (Utsar)
International Students' Forum
Japanese Club
Korean Student Association
Latin American Students Organization
Lebanese Social and Cultural Club
Northeastern Black Student Association
Organization for National Lebanese Youth
Republic of China Student Association
Vietnamese Students' Club

Media

Cauldron
The Northeastern News
NU Times
Onyx
Spectrum
WRBB-FM

Performing Arts Organizations

Band
Choral Society
Dance Theatre
Early Music Players
Orchestra
Silver Masque

Professional Organizations

Academy of Pharmacy Students
Alpha Zeta Omega (pharmacology)
American Chemical Society
American Institute of Chemical Engineers
American Institute of Industrial Engineers
American Society of Civil Engineers
American Society of
Mechanical Engineers
Association for Computing Machinery
Engineers Council
Future Black Lawyers Society
Institute of Electrical and
Electronics Engineers
Society for Women Engineers
Society for Professional Journalists

Religious Organizations

Baha'i Club
Baptist Student Fellowship
Campus Crusade for Christ
Chinese Christian Fellowship
Hillel
Islamic Society
Seekers Christian Fellowship

Special Interest Clubs

Amateur Radio Club
Amnesty International
Anglers' Society
Cheerleaders
Chess Club
College Republicans
Disabled Students Organization

Downhillers Ski and Sports Club
Entrepreneurs' Club
Flying Club
Husky Key Society
Hus-Skiers and Outing Club (NUHOC)
Investment Club
NU Bisexual, Lesbian and Gay Association
NU Reaching Other Worlds (NUROW)
Sailing Club
Society for Creative Anachronism
Students Aligned for Nuclear Disarmament (SAND)
Students for Animal Rights (STAR)
Students for Environmental Action (SEA)
Students for Life
Tactical Society
Women's Center

Honor Societies

The University encourages the achievement of excellence in scholarship by making monetary awards and chartering honor societies in the various academic disciplines. The following honor societies are chartered in the colleges:

Society	College
<i>The Academy</i>	Arts and Sciences
<i>Alpha Phi Sigma</i>	Criminal Justice
<i>Alpha Pi Mu</i>	Engineering, Department of Industrial Engineering and Information Systems
<i>Beta Alpha Psi</i>	Business Administration (Accounting)
<i>Beta Gamma Sigma</i>	Business Administration
<i>Boston-Bouvé</i>	Human Development Professions Honor Society
<i>Chi Epsilon</i>	Engineering, Department of Civil Engineering
<i>Eta Kappa Nu</i>	Engineering, Department of Electrical Engineering
<i>Eta Sigma Gamma</i>	Boston-Bouvé, Department of School and Community Health Education
<i>Financial Management Association</i>	Business Administration (Finance and Insurance)
<i>Kappa Delta Pi</i>	Boston-Bouvé
<i>Omega Chi Epsilon</i>	Engineering, Department of Chemical Engineering
<i>Phi Alpha Theta</i>	Arts and Sciences, Department of History
<i>Phi Kappa Phi</i>	All Basic Colleges, National Interdisciplinary Honor Society
<i>Phi Sigma</i>	Arts and Sciences, Department of Biology
<i>Pi Sigma Alpha</i>	Arts and Sciences, Department of Political Science
<i>Pi Tau Sigma</i>	Engineering, Department of Mechanical Engineering
<i>Rho Chi Society</i>	Pharmacy and Allied Health Professions
<i>Scabbard and Blade</i>	Reserve Officers' Training Corps
<i>Sigma Pi Sigma</i>	Arts and Sciences, Department of Physics
<i>Sigma Theta Tau</i>	College of Nursing
<i>Tau Alpha Pi</i>	School of Engineering Technology
<i>Tau Beta Pi</i>	Engineering

Election to college honor societies is based primarily on scholarship and integrity of character and is among the highest honors that can be conferred on an undergraduate.

Fraternities and Sororities

Sororities and fraternities play a vital role in the co-curricular life of the University. They can be reached through the Office of Student Activities, 255 Ell Center.

Fraternities	Sororities
Alpha Epsilon Pi	Alpha Epsilon Phi
Alpha Kappa Sigma	Alpha Kappa Alpha
Alpha Phi Alpha	Delta Phi Epsilon
Beta Gamma Epsilon	Delta Sigma Theta
Gamma Phi Kappa	Delta Zeta
Kappa Alpha Psi	Sigma Delta Tau
Nu Epsilon Zeta	Sigma Gamma Rho
Omega Psi Phi	Sigma Sigma Sigma
Phi Gamma Pi	
Phi Kappa Tau	
Phi Sigma Kappa	
Sigma Alpha Mu	
Sigma Phi Epsilon	
Tau Epsilon Phi	
Tau Kappa Epsilon	
Theta Delta Chi	

Intramural and Recreational Sports

A comprehensive program of intramural and recreational sports provides leisure-time activities for students throughout the year. Mandatory organizational meetings are held at the beginning of each quarter for all structured team sports and dual sport activities.

Intramurals The following intramural sports are offered:

	Fall	Winter	Spring	Summer
Aerobics	x	x	x	x
Basketball	x	x	x	x
Broomball	x	x	—	—
Flag football	x	—	x	—
Floor hockey	—	—	x	x
Ice hockey	x	x	—	—
Racquetball	x	x	x	x
Shape-ups	x	x	x	x
Soccer	x	x	x	x
Softball	x	—	x	x
Tennis	x	x	x	x
Volleyball	x	x	x	x
Wallyball	x	x	x	x
Wiffleball	—	x	—	x

Drop-in Recreation The Drop-in Recreation Program is an integral aspect of Northeastern's recreational opportunities that offers informal activities when facilities are not in use for physical education classes or athletic practices and contests. Recreational facilities include:

Basketball courts	Nautilus weight room
Fitness room	Racquetball courts
Free weight room	Stretching room
Ice-skating rink	Swimming pool
Indoor track	Tennis courts
Martial arts/wrestling room	Volleyball courts

Club Sports The Club Sports Program offers both intercollegiate competition and instruction and includes:

Figure skating	Shotokan Karate
Judo	Soccer
Lacrosse	Tae Kwon Do
Rugby	Volleyball
Sailing	

Athletic Facilities

Almost every sport and exercise activity is accommodated in such Northeastern athletic facilities as the Cabot Physical Education Center, Edward S. Parsons Field, the 6,000-seat Matthews Arena, the Bernard and Jolane Solomon outdoor track and field facility in Dedham, and the new Henderson boathouse.

Cabot Gymnasium contains four basketball courts, a state-of-the-art gymnastic room, three weight rooms (Nautilus, free weights, and Universal), a wrestling and martial arts room, four racquetball courts, an aerobics area, and a rowing tank. Cabot Cage's multipurpose surface can accommodate three basketball, tennis, or volleyball courts and can host football, baseball, soccer, and field hockey teams. Barletta Natatorium—home of the swimming and diving teams—is equipped for all water competitions, handicapped swim programs, and recreational swimming.

Parsons Field—home of the Huskies football, soccer, and field hockey teams—also features the Friedman Diamond for varsity baseball. The Solomon track hosts major eastern track championships and is a permanent site for Northeastern track athletes. The hockey and basketball teams play their home games in the 6,000-seat Matthews Arena, the oldest ice hockey rink in the world. Located near the main quadrangle of the campus, the arena also offers free public skating daily. The newly opened Henderson boathouse is considered the finest facility of its kind in the country.

Men's Athletics

The University fields Division I teams in baseball, crew, swimming, soccer, cross-country, track and field, football, hockey, basketball, golf, and tennis. Varsity entries have competed on such sites as England's Henley-on-Thames, Madison Square Garden, and Fenway Park.

The baseball team has won more than 20 games in the North Atlantic Conference in three of the last four seasons, and competed in conference tournament action. Northeastern's basketball Huskies play powers such as Indiana, Illinois, Ohio State, Maryland, Louisville, Houston, and Virginia. Northeastern has had 27 winning seasons in the last 30 years and has participated in six of the last eleven NCAA championships.

During its first season in 1965, the varsity crew won four of five regattas and the small-college rowing championships. The first Northeastern team to compete internationally (in the Henley Royal Regatta), the Huskies won the Eastern Sprints in 1972 and 1973 and went on to row the Grand Challenge Cup race at Henley. The Northeastern crew returned to Henley and the Challenge Cup as champions of the I.R.A. Regatta in Syracuse in 1988.

Northeastern annually fields one of the most competitive Division I-AA football teams in New England. A partial list of the Huskies' opponents includes New Hampshire, Massachusetts, Lehigh, James Madison, Rhode Island, and Harvard. Three current National Football League players earned varsity letters and undergraduate degrees from Northeastern.

The University's hockey team skates in the Hockey East Association. In 1985 the Huskies became the first team since 1979 to win back-to-back Beanpot Hockey Tournaments. Three years later, they captured the prestigious Beanpot and Hockey East championships.

In 1988, the men's varsity swimmers won the coveted ECAC Championships. The Huskies have had 11 New England indoor titles and as many outdoor championships. Each year, Northeastern alumni run for national and international honors as members of top track and field clubs. Several Northeastern track athletes have competed in Olympic Trials and Games over the past two decades. Recently, the University cross-country team earned a berth in the NCAA Championships and was represented by an All-American selection.

Women's Athletics

The women's intercollegiate athletic program reflects tremendous growth. As a member of the NCAA, our program encompasses basketball, crew, cross-country, field hockey, gymnastics, ice hockey, swimming and diving, track and field (indoor and outdoor), and volleyball. Athletic scholarships are available to women student athletes in all programs.

Our field hockey team maintained its position in the nation's top ten, finishing in the Final Eight in each of the last two years. The gymnastics team continued to push toward the NCAA Regional Championship. The ice hockey team perennially contends for the national title and is the defending Beanpot Champion.

In the water, Northeastern divers represented the University in the most recent NCAA championships and the women's crew is considered among the nation's finest.

Appendix

Governing Boards and Officers of Northeastern

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Louis H. Barnett	Alfred di Scipio	Robert W. Holmes
Charles L. Bates	Estelle Dockser	Barry M. Horowitz
Lincoln C. Bateson	Theodore S. D'Orlando	Hartwell G. Howe
Ruth M. Batson	Sarah T. Dowling	Ralph E. Hutchins
Alan D. Bell	William J. Downey	Deborah C. Jackson
Alfred M. Bertocchi	David F. Doyle	Edward C. Johnson, 3d
S. Whitney Bradley	William S. Edgerly	Richard P. Johnson
John E. Buckley	Richard J. Egan	Richard Kazmaier
Wayne A. Budd	Thomas A. Farrington	Walter B. Kelley
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John L. Burns	Robert P. Ferris	Walter I. Keyes
Victor C. Bynoe	Kenneth G. Fisher	Calvin A. King
James F. Carlin	Frieda Garcia	Thomas L. King
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George C. Chryssis	Paul W. Glennon	Dean T. Langford
Livingstone N. Coakley	Robert H. Goodale	Andre A. Laus
Abram T. Collier	Rosalind E. Gorin	Maurice Lazarus
Walter J. Connolly, Jr.	Joseph A. Grady	John R. Leeman
Dorothy G. Cooley	Corinne P. Grande	Elma Lewis
James J. Costello	John L. Grandin	George M. Lovejoy
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M. Dorothy Massey
Terence P. McDermott
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Ara Oztemel
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Lawrence T. Perera
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Ernest J. Sargeant
Donald W. Seager
Sydney Shaftman
James L. Shanahan
Dorothy M. Simon
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Scholarships

The scholarships listed below are awarded through the Office of Financial Aid. For more information, see the Financial Aid section, pages 30–34.

University Scholarships

Leonard S. Adelman Memorial Scholarship *College of Criminal Justice* This scholarship was established in 1986 through the generosity of the family, friends, and professional colleagues of Mr. Adelman, a 1978 dean's list graduate of the College of Criminal Justice. It is a living memorial to a man of character, courage, and selflessness and to an honored athlete. He was a dedicated police officer, cited more than thirty times for heroism, and in 1980, at age 25, sacrificed his life in the line of duty. The earnings from the fund are awarded annually to a fourth-year student at his college who, in the opinion of its faculty, best exemplifies Leonard's dedication to scholarship, a sound character, and a highly motivated career in law enforcement. Financial need is not a requirement. A plaque or trophy in honor of Mr. Adelman is also presented to the outstanding senior in the College of Criminal Justice interested in a municipal policing career. Both names are inscribed on a memorial master plaque at the University.

The George I. Alden Scholarship Fund *All Colleges* George I. Alden (1843–1926) was a Worcester educator, scientist, and entrepreneur, and a founder of the Norton Company. This fund was created by a 1987 challenge grant from the George I. Alden Trust and matching gifts from more than 600 donors. Leadership donors included: Alden Electronics, Inc.; Vance G. Blake; Robert S. Bleakney; Harry Doehla Foundation; Lawrence H. Fisher, Esq.; GenRad Foundation; Louis L. Guerriere; David D. Haig, Jr.; Louis C. Iandoli; Robert L. Johnson; Mr. and Mrs. Darald R. Libby; New England Telephone Company; Norton Company; Alan P. Pandiani; Edward M. Perdue; Robert J. Perry; John W. Rabe; George P. Sakellaris; Vahan L. Sarkisian; Shawmut Worcester County Bank, N.A.; and Jacob Zager. Income from the fund is awarded annually to qualified upperclass students participating in the University Honors Program who are residents of Worcester County.

John M. Alden Honors Scholarship *All Colleges* This scholarship was established in 1989 by Northeastern University alumnus S. C. Sviokla '47 and his wife Chanda in memory of John M. Alden of Needham, Massachusetts. Income from the fund will be awarded annually to students who show financial need and who have earned honors standing in their college.

Vivian B. Allen Scholarships *College of Nursing* The Vivian B. Allen Foundation Endowment for nursing scholarships was established in 1968 through the generosity of the Vivian B. Allen Foundation, Inc. The income from a \$500,000 endowment provides scholarship assistance for students entering or enrolled in the College of Nursing. The application procedures and qualifications for selection are the same as those for all other scholarships.

Alumni Scholarships *All Colleges* Scholarship aid is available to entering students who are relatives of alumni. Applications must show scholastic achievement and financial need.

American Optical Foundation Scholarship *All Colleges* This annual scholarship was established in 1986 through the generosity of the American Optical Company to benefit entering freshmen from communities in southern Worcester County. Awards are made to students who demonstrate ability, soundness of character, and financial need.

Chet April Scholarship Fund *College of Arts and Sciences—Marine Studies* This fund was established in 1971 in memory of Chet April with an endowment provided by his friends and associates in the Lynn Volunteer Tuna Club. The income from the fund is awarded annually to one or more upperclass students enrolled in the marine studies program. Awards are given on the basis of demonstrable financial need and above-average scholastic achievement. Preference may be given to deserving students from the North Shore area.

Irving Aronson Scholarship *College of Engineering—Electrical Engineering* The Irving Aronson Scholarship for Electrical Engineering students was established through the generosity of the family of Irving Aronson as a living memorial to a man who shared his life with many people and who cared so much for the educational process. Income from this fund is awarded or loaned to electrical engineering students who demonstrate financial need and academic responsibility.

Alice S. Ayling Scholarship *College of Arts and Sciences* Several scholarships are awarded annually to students in the College of Arts and Sciences who demonstrate a strong academic record, financial need, good citizenship, and leadership through involvement with extracurricular and community activities. Usually, these scholarships continue through the senior year.

Bank of New England Scholarship Fund *All Colleges* This fund was established in 1989 by a generous grant from the Bank toward Phase II of The Century Fund campaign. The award recognizes the extensive and long-term relationships between the Bank and the University, as well as the role played by Northeastern in the quality of life of Boston's citizens. Income from the fund provides financial aid to Northeastern students who are graduates of the Boston Public Schools. Preference is given to minority students who have participated in the academic enrichment program conducted by the Balfour Academy at Northeastern and/or attended West Roxbury High School. Recipients must demonstrate financial need and academic stability.

George L. Barnes Scholarship *All Colleges* This fund was established in 1969 by Miriam P. Poole, daughter of George L. Barnes, in memory of her father, a distinguished member of the Northeastern University Corporation and Board of Trustees from 1937 until his death in 1965.

The income from this fund will annually provide a scholarship to a deserving student from Weymouth, Massachusetts. The award is made on the basis of need and character. Some additional assistance may be given in the upperclass years.

Barry Scholarship *College of Engineering* The Barry Scholarship, established in 1973 by the Barry Division of Barry Wright Corporation, is available to students in the College of Engineering. Preference is given to mechanical engineering majors and sons and daughters of Barry employees on the basis of demonstrable financial need and academic achievement.

Mr. and Mrs. Emil Matthew Bauer Fund *All Colleges* The interest from the fund, established in 1954, is used for scholarships or other financial assistance to students of German birth or of German extraction studying at Northeastern University. The scholarships are available to either men or women students enrolled in any year at the University.

Douglas F. Baxter Scholarship Fund *Mechanical Engineering* The Douglas F. Baxter Scholarship Fund was established in 1979 by Dr. Roy E. Baxter and family to honor a man who loved his country and gave his life in service for it during the Second World War. He had graduated from Northeastern University in 1942. The income from this fund is to be awarded annually to a student at Northeastern University majoring in Mechanical Engineering. This award is based on scholastic achievement and is open to all students, regardless of financial need.

George and Tillie Bennett Scholarship *All Colleges* This fund was established in 1990 by a bequest from George Bennett, a 1924 graduate of the School of Commerce and Finance. Mr. Bennett designated that the income from this fund should be used to provide financial assistance to worthy and needy students to assist them in furthering their education at Northeastern University.

Lena M. and Elbridge A. Bollong Memorial Scholarship Fund *College of Business Administration* This scholarship was established in 1987 in memory of Lena M. and Elbridge A. Bollong. Elbridge A. Bollong was a 1917 graduate of the School of Commerce and Finance. The income from this fund is awarded annually to undergraduate students in the College of Business Administration who demonstrate financial need, academic stability, and soundness of character.

Alvah K. Borman Memorial Scholarship *Gamma Phi Kappa Fraternity Undergraduates* This scholarship was established in 1976 through the generous contributions of Gamma Phi Kappa Fraternity alumni. In 1979, the Gamma Phi Kappa Fraternity Alumni Association, Incorporated, voted to name the scholarship in memory of Alvah K. Borman, Northeastern University's Dean of Graduate Placement. Dean Borman was an active member of the GPK fraternity for over 46 years, serving as an undergraduate brother (Class of 1936) and faculty adviser from 1953 to 1965, an active alumnus until his death in 1979. Awards from this fund are made annually to undergraduate members of the Gamma Phi Kappa Fraternity who have demonstrated good academic standing. Recipients must have been members in good standing of the Gamma Phi Kappa Fraternity for at least six months prior to the time of award.

Boston-Bouvé Class of 1935 Scholarship *Boston-Bouvé College of Human Development Professions* This fund was established in 1985 by the graduates of Boston-Bouvé College, Class of 1935. The income from the fund is awarded annually to a sophomore or junior majoring in health education, physical education, or physical therapy in Boston-Bouvé College of Human Development Professions. The recipient must be a responsible student of sound character with demonstrated leadership ability and a minimum quality-point average of 3.0.

Boston Housing Authority Scholarships *All Colleges* As an expression of Northeastern's commitment to the city of Boston, the University has established 100 full-time undergraduate scholarships for residents of housing developments run by the Boston Housing Authority (BHA). Applicants for the scholarships, which were offered for the first time in September 1984, must meet the requirements for admission to Northeastern and be residents of BHA housing.

Martin Brown Scholarship Fund *College of Engineering* This scholarship was established in 1961 by Mr. Martin Brown, an engineering alumnus of the Class of 1921. Its purpose is to assist qualified students enrolled in the College of Engineering who have need and have demonstrated above-average scholastic ability.

Richard D. Bruhmüller Accounting Scholarship *College of Business Administration—Accounting* This annual scholarship was established in 1985 through the generosity of Richard D. Bruhmüller and his wife, Elizabeth. Mr. Bruhmüller, an accounting graduate and partner in the public accounting firm of Tobin & Waldstein, established the fund to benefit students of ability and need who have chosen to pursue a career in public accounting. The income from the fund is awarded each year to an upperclass accounting student who displays ability, soundness of character, and financial need.

Wellington Burnham Fund *All Colleges* This fund provides financial assistance to worthy students of limited means without discrimination as to race, creed, color, or scholastic attainment. It was established in 1961 under the provisions of the will of George A. Burnham.

Godfrey L. Cabot Scholarship Fund *All Colleges* This fund was established by Dr. Cabot in 1954 to help meet the college expenses of employees or children of employees of Godfrey L. Cabot, Inc., and its subsidiary and associated companies. To be eligible, the employee must have completed at least five years of service with the company prior to the time the student enters the University. The University shall determine the number and amount of these scholarships, which are not limited to outstanding students and which are available to evening as well as day students. Students interested in applying for scholarship aid from this fund should communicate with the Cabot Personnel Office or the Office of Financial Aid at Northeastern University.

Cameron and Colby Ellis H. Carson Scholarship Fund *College of Business Administration* This fund was established in 1983 by Cameron and Colby Company, Inc., in honor of Mr. Carson, former president of its Treaty Reinsurance Activity, known as NERCO. The income from this fund is used to assist a freshman in the College of Business Administration who demonstrates not only financial need but also academic promise deemed consistent with the high standards of foresight and acumen that characterized the career of Ellis H. Carson.

Camp Dresser & McKee, Inc., Scholarship *All Colleges* This scholarship was established in 1973 by Camp Dresser & McKee, Inc., and is available to students in all colleges. Preference for awards is based upon demonstrable financial need and academic achievement.

Louis S. Cashman Memorial Scholarship Fund *College of Business Administration* This fund was established by the Massachusetts Credit Union Association (CUNA) and friends of Mr. Cashman in recognition of his outstanding service to the credit union movement in Massachusetts. This scholarship is awarded annually to students in the College of Business Administration who have need, with particular preference given to those enrolled in banking and finance.

Gardner A. Caverly Scholarship *All Colleges* This scholarship was established in 1957 through the generosity of Mr. Gardner A. Caverly, an alumnus of the College of Business Administration and a member of the Class of 1934. Its purpose is to provide financial assistance and encourage qualified students from the New England area to attend Northeastern University. In selecting worthy students for these scholarship awards, preference is given to graduates of the Rutland, Vermont, and Laconia, New Hampshire, high schools.

Joel Barry Chase Scholarship *College of Engineering—Civil Engineering* The Joel Barry Chase Scholarship in Civil Engineering was established in 1989 through the generosity of Joel Barry Chase, E'67, for undergraduate students majoring in civil engineering. Annual awards are made on the basis of sound character, stable academic record, and financial need.

Joel Cherande Scholarship Fund *All Colleges* This fund was established in 1990 by Joel Cherande, Class of 1968, to provide financial aid to needy students. Preference is given to students with average high school records from the Chelsea public school system who are motivated to improve their scholastic standing, show potential to succeed, and could not attend Northeastern University without financial aid. Endowment income is awarded annually by the Office of Financial Aid.

Vessarios G. Chigas Memorial Scholarship *College of Engineering—Electrical and Computer Engineering* This fund was established in 1990 in memory of Vessarios G. Chigas, a distinguished graduate of the College of Engineering, Class of 1944. Funds for the scholarship were provided by friends of Mr. Chigas and by M/A-COM, Inc. Mr. Chigas was a founder, senior officer, and director of M/A-COM, Inc. of Burlington, Mass., a maker of microwave and electronic components.

Income from the fund provides full-tuition awards to students interested in pursuing an education in the Department of Electrical and Computer Engineering. Preference is given to students from the Greater Lowell area who are in the top quartile of their class and have a financial need for more than two-thirds of full tuition assistance. Such students are known as Chigas Scholars and are eligible to continue to receive full scholarship support as long as they continue to demonstrate financial need and maintain standing in the upper quartile of the class.

Carl W. Christiansen Scholarship *College of Business Administration* The fund was established in 1976 by Carl W. Christiansen, a graduate of the School of Commerce and Finance, Providence Division of Northeastern University, Class of 1923. Early in his career, Mr. Christiansen was an accounting instructor and associate dean in the Providence Division. In 1927, the accounting firm of Christiansen, Murphy and Company was founded, which in 1940 became known as Christiansen and Company—Certified Public Accountants. Income from this fund is awarded annually to an entering freshman in the day College of Business Administration who has demonstrated the need for financial aid. Preference will be given to students from Rhode Island who are interested in pursuing a career in accounting.

Chryssis/Pappas Memorial Scholarship Fund *College of Engineering—Electrical and Computer Engineering* This scholarship fund was established jointly in 1989 by engineering graduates George C. Chryssis, E'72, ME'77, and Arthur A. Pappas, E'60, in memory of their fathers, Christopher G. Chryssis and Alexander A. Pappas. Grants from the fund provide annual scholarship awards, with preference given to students of Greek descent who demonstrate scholastic achievement and financial need. International students who meet these criteria are eligible.

The donors, both of Greek descent, attended Northeastern after becoming residents of the United States. They later distinguished themselves as engineers and businessmen, founding several successful high-technology companies in Massachusetts. The Chryssis/Pappas Memorial Scholarship Fund

expresses the donors' appreciation of their families, their heritage, and the opportunity a Northeastern education holds for those who follow them.

Class of 1967 Alumni Scholarship *Day College* The Northeastern University Class of 1967 Alumni Scholarship was established in 1967 and endowed in 1982 by the Class of 1967. Income from the fund is awarded each year on the basis of financial need, campus activities, and scholastic achievement. Priority will be given to children, other relatives, and friends of the Class of 1967.

Richard S. Cole Scholarship Fund *College of Engineering—Chemical Engineering* The Richard S. Cole Scholarship Fund in Chemical Engineering was established in December 1987 by Richard S. Cole, E'44, an active and loyal alumnus. Income from the fund is awarded annually to a chemical engineering major who has demonstrated academic achievement and financial need.

Ruby H. Cole Scholarship Fund *All Colleges* The Ruby H. Cole Scholarship Fund was established in 1973 under the will of Mrs. Cole, of Boston, Massachusetts. Income from the fund is awarded annually to one or more female students enrolled in or admitted to undergraduate programs of the Basic Colleges of the University and who are graduates of Roxbury High School. Recipients must demonstrate financial need, academic stability, and soundness of character.

Commercial Union Insurance Companies Scholarship *College of Criminal Justice* The income from this fund, established in 1982, is used to provide a scholarship to an entering first-year student who demonstrates need and shows promise of success in the law enforcement field.

Community Scholarships *All Colleges* Established by President Asa S. Knowles in 1963–73, these scholarships provide that Northeastern will ensure the full freshman-year tuition through scholarships and grants for qualified students. Students must follow the normal application procedure and demonstrate need. The following Massachusetts communities are designated: Ashland, Belmont, Boston, Brookline, Burlington, Chelmsford, Dedham, Framingham, Marlboro, Marshfield, Milford, Peabody, Stoneham, Weston, Westwood, Weymouth, and Winchester.

Compugraphic Corporation Scholarship Fund *All Colleges* The Compugraphic Corporation Scholarship Fund was established and endowed with a generous gift from an individual. Income from the fund provides financial assistance for persons admitted to or enrolled in full-time undergraduate programs of the Basic Colleges of the University who demonstrate financial need, academic stability, and soundness of character, and who are, at the time of the grant, children of current employees of Compugraphic Corporation, division of Agfa, Inc.

Arnold L. Cormier Memorial Scholarship *College of Criminal Justice* The Arnold L. Cormier Memorial Scholarship Fund was established in 1980 by Joseph L. and Ruth E. Cormier in memory of their son, Arnold, a student in the College of Criminal Justice, Class of 1981. Arnold was a good student with excellent grades and was an active participant in classroom discussions and college activities. To perpetuate the memory of Arnold Cormier and the spirit of good fellowship for which he stood, this scholarship is awarded annually to a senior in the College of Criminal Justice.

Earl L. Cragin Scholarship *All Colleges* This scholarship was established by a bequest from Earl L. Cragin, a 1924 graduate of the School of Commerce and Finance. Preference will be shown to applicants from Reading, Wakefield, or Greater Boston who demonstrate academic promise and soundness of character.

George C. and Penio G. Culolias Scholarship Fund *All Colleges* This fund was established in 1986 through the generosity of Mrs. Penio G. Culolias, a friend of Northeastern University, with a strong belief in the value of cooperative education. This scholarship is awarded annually to an upperclass student on the bases of financial need and academic promise.

Salvatore J. and Corinne Danca Scholarship *All Colleges* The Salvatore J. and Corinne Danca Scholarship, established in 1974 by Salvatore J. Danca, a graduate of Northeastern University, Class of 1934, is awarded annually to a student enrolled as a sophomore. Selection is made by the Committee on Scholarships, using academic excellence and financial need as the criteria.

Elizabeth A. Davey Scholarship for Physical Therapy *Boston-Bowd College of Human Development Professions* The Elizabeth A. Davey Scholarship for Physical Therapy students was established through the generosity of the family and friends at Choate Memorial Hospital on behalf of Elizabeth A. Davey, as a living memorial to a woman who shared her life with so many people. Income from this fund is awarded or loaned to a physical therapy senior who demonstrates superior academic achievement and financial need.

C. Denson Day Scholarship Fund *College of Engineering—Mechanical Engineering* This scholarship was established in 1988 by C. Denson Day, a College of Engineering alumnus from the Class of 1926, and his wife Barbara, in fond memory of two of his professors, Emil Gramstorff and Alfred Ferretti. Income from the fund is awarded to mechanical engineering students who demonstrate financial need and academic responsibility.

Paul A. deNapoli Fund *College of Engineering* This endowed scholarship fund was established in 1990 by Paul A. deNapoli, a 1952 engineering graduate, and his wife, Phyllis, to benefit students majoring in Engineering. Preference is given to students who demonstrate financial need. Mr. deNapoli spent his business career in the field of consulting engineering.

Charles M. Devlin Scholarship *All Colleges* This fund was established in 1976 by the members of the Class of 1970 "in honor of our dedicated adviser," Charles M. Devlin. The income from the fund is awarded annually to upperclass students with proven ability and demonstrable financial need. Preference is given to children of members of the Class of 1970.

Diamond Anniversary Development Program Scholarship *All Colleges* This scholarship was established to commemorate the successful conclusion of the Diamond Anniversary Development Program. This scholarship recognizes the loyalty and generosity of the thousands of alumni and friends, corporations, foundations, and organizations whose significant contributions of time and resources have brought Northeastern University to "that greatness which is its destiny."

Three \$1,000 scholarships are awarded annually, as follows: to one or more full-time students enrolled in a cooperative education program within a Basic College of the University, to one or more part-time students enrolled in a Basic College of the University, and to one or more full-time students enrolled in the graduate division or a professional school of the University. Consideration is based upon financial need, academic stability, and soundness of character.

William O. DiPietro Scholarship *College of Engineering* This scholarship was established in 1967 through the generosity of Mr. William O. DiPietro, a distinguished alumnus of the College of Engineering and a member of the Class of 1942. The scholarship is awarded to one or more deserving freshmen who demonstrate a high caliber of achievement and a desire to fulfill the limits of their ability in both academic and cooperative periods of study. In considering recipients for this scholarship, preference is given to freshmen enrolled in the College of Engineering who have a desire to major in chemical engineering. It is intended that those students receiving awards from this scholarship might someday contribute to this or other scholarships themselves, thereby perpetuating growing funds that will help other deserving individuals.

Harry Doehla Memorial Scholarship *All Colleges* The Harry Doehla Memorial Scholarship was established in 1974 in memory of Harry Doehla, founder and president of Doehla Greeting Cards, Inc. During his lifetime, Mr. Doehla provided much financial assistance to young people of limited means to help further their educational goals. The awards from this fund are available to undergraduate day students, with preference being given to graduates of Fitchburg High School, Fitchburg, Massachusetts, and Nashua High School, Nashua, New Hampshire. Additional consideration will be given to children of employees of Doehla Greeting Cards, Inc.

Michael A. D'Orlando Scholarship Fund *All Colleges* This fund was established in 1990 by Michael A. D'Orlando, Class of 1952, and a loyal and active alumnus. This scholarship will be awarded annually to a full-time undergraduate student who demonstrates academic stability, financial need, and soundness of character.

Theodore S. D'Orlando Scholarship Fund *University College* This fund was established in 1991 by Theodore S. D'Orlando, a graduate of the evening School of Business, Class of 1951. Past president of the Alumni Association and member of The National Council, Husky Associates, and The Huntington Society, Mr. D'Orlando earned an MBA from the College of Business Administration in 1957. Income from this fund is used to assist part-time students of average academic record who are enrolled in a University College degree program and are motivated to improve their scholastic standing, show potential to succeed, and who without financial aid, could not attend Northeastern. Endowment income will be awarded annually by the Office of Financial Aid.

Cpl. James B. Downey USMC Scholarship Fund *All Colleges* This scholarship was established in 1970 through the generosity of William J. Downey, a graduate of the College of Liberal Arts, Class of 1952, in memory of his brother, Cpl. James B. Downey, USMC. The scholarship is awarded annually to an upperclass student in the day colleges who has demonstrated the need for financial aid.

Agnes F. Driscoll Scholarship Fund *All Colleges* This fund provides scholarship assistance to upperclass students who demonstrate financial need and scholastic attainment.

John Elfers Memorial Scholarship *All Colleges* This scholarship was established in 1983 by William and Ann Rice Elfers in memory of Mr. Elfers's brother. The income from the fund is awarded annually to undergraduate students who demonstrate financial need, academic promise, and soundness of character.

Carl Stephens Ell Alumni Scholarships *All Colleges* To honor Dr. Carl Stephens Ell, the second president of Northeastern, the Alumni Association established these scholarships in 1958. Awards are made to worthy students on the basis of scholastic ability and need. The scholarships are distributed among students in the Basic Colleges and University College. Preference is given to sons and daughters of Northeastern alumni.

Robert and Sara G. Erickson Scholarship *All Colleges* This scholarship was established in 1991 by a bequest from the estate of Robert Erickson. A distinguished and active engineering graduate, Class of 1926, Mr. Erickson resided in California for many years and was retired as executive vice president of Beckman Instruments. He served as a Director of The National Council and as a member of the Corporation from 1961 until his death in 1989. Awards of \$5,000 are provided annually to attract and retain quality students from California with preference for students attending schools in Orange County, which was Mr. Erickson's home county, and to children of Northeastern alumni. Recipients may continue to receive these awards in their upperclass years.

Elmer H. and Daisy M. Everett Memorial Scholarship *All Colleges* This scholarship was established through a bequest of Elmer H. and Daisy M. Everett, both alumni of Northeastern University, Class of 1934. Mr. Everett graduated from the College of Engineering, and Mrs. Everett graduated from the School of Business. The Everetts had a strong commitment to help young people wanting to further their education. The fund is administered by the Office of Financial Aid.

Frank L. and Mary C. Farwell Scholarship *All Colleges* This scholarship was established in 1987 by Frank L. Farwell and his wife, Mary C. Farwell. A member of the Northeastern Corporation since 1956 and a trustee of the University since 1958, Mr. Farwell is retired as chairman of the board of Liberty Mutual Insurance Companies and received an honorary degree from Northeastern in 1985. The income from the fund is awarded annually to freshmen who demonstrate financial need.

Michael T. Federico Memorial Fund *All Colleges* The Michael T. Federico Memorial Fund was established in 1982 by the Rhode Island Alumni Club, fellow alumni, and friends of Michael T. Federico, a graduate of the Class of 1940 and a lifelong resident of Rhode Island. Income from the fund is awarded annually to one or more students from Rhode Island who are in their sophomore year, have attained a quality-point average of 3.0 or better, and have demonstrated financial need.

George Raymond Fennell Memorial Scholarships *College of Business Administration* Two full-tuition scholarships are awarded each year to freshmen enrolled in the College of Business Administration. The scholarships are awarded in memory of George Raymond Fennell, formerly assistant director of admissions and director of the Northeastern Student Union.

Neal F. and Mary T. Finnegan Scholarship *All Colleges* This fund was established in 1987 by Neal F. Finnegan, a graduate of Northeastern University, and his brother Richard B. Finnegan, a graduate of Stonehill College, to commemorate the 50th wedding anniversary of their parents, Neal and Mary Finnegan. The sons desire that recipients of this scholarship be students from the Roxbury and Dorchester areas of Boston, where they grew up. Preference will be given to freshmen enrolled in the Basic Colleges who demonstrate financial need, academic stability, and soundness of character.

Kathleen Foley Scholarship in Pharmacy *College of Pharmacy and Allied Health Professions* This scholarship was established in 1990 by faculty and staff of the College of Pharmacy and Allied Health Professions, alumni of the Pharmacy program, and friends in appreciation for her years of dedicated service to the College. To students and faculty, to alumni and friends of the College, Ms. Foley was a constant source of help, information, and personal interest. The scholarship is awarded to middlers, juniors, or seniors and is based on financial need, academic performance, and overall character.

Clara and Joseph F. Ford Scholarship Fund *All Colleges* As loyal friends and generous benefactors, Joseph F. and Clara Ford were deeply committed to Northeastern and to helping students who might otherwise never receive a college education and, therefore, never achieve their goals or reach their potential. For years Northeastern benefited from the spirit and support of Joseph and Clara Ford in scholarships and awards, in libraries, and elsewhere. A member of the Northeastern University Corporation from 1945 to his death, Mr. Ford received an honorary degree from Northeastern in 1979. He and Mrs. Ford established this scholarship in 1962 and contributed to it often during their lifetimes. Subsequent to Mr. Ford's death in 1984 and Mrs. Ford's death in 1987, a major gift was made to Northeastern University which was added to this scholarship. Income from this permanently endowed scholarship Fund will be awarded annually to students who are worthy and deserving of financial support.

Foster Grant Scholarship *All Colleges* This scholarship, established in 1974 by the Foster Grant Co., Inc., of Leominster, Massachusetts, is available to students in any of the full-time undergraduate colleges. Preference is given to children of employees of Foster Grant Co., Inc. Bases for the award are demonstrable financial need and above-average academic achievement.

Chester R. Frost Scholarship Fund *College of Business Administration* This scholarship was established in 1984 through the generosity of Chester R. Frost, a distinguished alumnus of the College of Business Administration and a loyal member of the Class of 1962. Income from this fund is awarded annually as a scholarship to a business student who displays soundness of character, a stable academic record, and financial need. Preference is given to students majoring in accounting.

James R. Fuller Memorial Scholarship Fund *College of Business Administration* This fund was established in 1989 by the family, friends, and business associates of James R. Fuller, a distinguished 1966 graduate of the College of Business Administration. Mr. Fuller was one of 259 passengers on Pan Am flight 103, which was destroyed by a terrorist bomb on December 21, 1988 over Lockerbie, Scotland. A highly successful automobile industry executive and a director of The National Council at Northeastern, Mr. Fuller was vice president in charge of Volkswagen United States, Inc., at the time of his death. Income from the fund is awarded annually to an undergraduate student with a concentration in marketing who demonstrates academic stability, financial need, and soundness of character. Preference is given to students considering auto industry or international marketing careers.

Herbert W. and Geraldine E. Gallagher Athletic Scholarship Fund *All Colleges* This scholarship was established by Wendy L. Gallagher, a Northeastern University graduate in the Class of 1975, as a tribute and expression of her love for her parents on their golden wedding anniversary.

Herbert W. Gallagher, Class of 1935, was an outstanding athlete as an undergraduate and was elected to Northeastern's Athletic Hall of Fame in 1975. He served the University with dedication for over 40 years as a successful coach in hockey and baseball and as its athletic director.

This scholarship is awarded annually to a deserving male hockey player who demonstrates financial need, academic ability, and soundness of character.

Wendy L. Gallagher Memorial Scholarship Fund *All Colleges* This scholarship was endowed by the parents of Wendy L. Gallagher, Class of 1975, in 1990 as a tribute and expression of their love for Wendy who had a great interest in the athletic programs at Northeastern. Wendy died in June 1986. This scholarship is awarded to a deserving varsity male hockey player or to students pursuing careers in education who demonstrate financial need, academic stability, and soundness of character.

Gamma Phi Kappa Fraternity Scholarship *All Colleges* The Gamma Phi Kappa Fraternity Scholarship was established in 1972 by the Gamma Phi Kappa Fraternity Alumni Association, Incorporated, and was endowed in 1976 through the generous contributions of Gamma Phi Kappa Fraternity alumni and undergraduates. Awards are made annually from interest on the endowment to undergraduate students enrolled in the basic day colleges of Northeastern University who demonstrate good academic standing and financial need. Undergraduate members of the Gamma Phi Kappa Fraternity are ineligible to apply for this award.

Nathan Gerber Memorial Scholarship *All Colleges* The Nathan Gerber Memorial Scholarship was established in 1974 by Albert Gerber, E'52, and Robert Gerber, E'60, in memory of their father, Nathan, a member of the Class of 1925. The scholarship is awarded annually to a student or students enrolled in the freshman class with a demonstrable financial need. Selection is made by the Committee on Scholarships.

Robert Girouard Memorial Baseball Endowed Scholarship Fund *All Colleges* This scholarship was established by teammates, friends, and associates of Robert Girouard as a tribute to and expression of their love for him. Bob Girouard was a 1959 Business Administration graduate of Northeastern University. He was a conscientious student, a good school citizen, an outstanding baseball player, and a young man of unusual integrity and high spirit. His untimely death was a great loss to his family and friends.

John and Ethel Goldberg Scholarship Fund *All Colleges* This fund was established in 1984 through a bequest by Ethel Goldberg. The income from this fund is used by the University for the tuition of those students the University deems deserving upon the basis of demonstrable financial need and academic achievement. These awards are available to undergraduate day college students.

Robert L. Goldberg Scholarship *College of Engineering—Chemical Engineering* This scholarship was established in 1988 through the generosity of Robert L. Goldberg, a chemical engineering graduate and a member of the Class of 1959. Income from this fund is awarded annually to those upperclass students majoring in chemical engineering who display soundness of character, a stable academic record, and financial need.

M. William Grant Scholarship *College of Engineering—Mechanical Engineering* This scholarship was established in 1988 by the Ingersoll-Rand Company in honor of M. William Grant, E'47, on the occasion of his retirement. Mr. Grant is an active and concerned alumnus and serves as a director of The National Council of Northeastern University. In his position as Vice President for Technology at Ingersoll-Rand, he was a driving force in the field of mechanical engineering. Mr. Grant attended North Quincy High School, Quincy, Massachusetts; it is therefore his wish that this scholarship benefit graduates of this school who are enrolled in the College of Engineering. Preference is given to students majoring in mechanical engineering.

Greater Boston Consumer Credit Grantors Association Scholarship *College of Business Administration* In 1985, the Consumer Credit Grantors Association, Inc., established an endowed scholarship fund, the income from which is awarded annually to students from Massachusetts in their upperclass years majoring in business administration. Selection is based on financial need, academic promise, and soundness of character. Preference is given to students who express an interest in the field of consumer credit.

Clifton W. Gregg Memorial Scholarship *All Colleges* This scholarship was established through a bequest of Clifton W. Gregg, a 1915 graduate of the School of Commerce and Finance of Northeastern University. It was Mr. Gregg's request that "the income for this fund be used for the assistance of financially needy students." The award may be made annually. Recipients are determined by the Committee on Scholarships.

Rabbi Myer O. Grunberg Scholarship *All Colleges* Established in 1953 by Mrs. Myer O. and Miss Rose Grunberg, this annual award is available to a senior student in any college of the University. The award is made to students who have evidenced in personal business and student relations those characteristics of leadership and human relations that make for a better social order. There is no restriction as to race, creed, color, or sex.

Curtis Lemar Haigh Scholarship Fund *All Colleges* This fund was established with a gift of \$5,000 from the parents of Curtis Lemar Haigh as a tribute and expression of their love for him. Curtis Lemar Haigh was a 1981 graduate of Scituate High School and a speech communication major in the Northeastern University Class of 1985. He died on February 1, 1985, before graduating. During his four years at Northeastern, Curtis was perhaps the most active staff member of WRBB, the campus radio station. This scholarship is to be made annually to a speech communication major who is a member of the junior class at Northeastern University and who shows academic achievement and professional promise.

James F. Haley Scholarship Fund *College of Engineering* This fund was established in 1984 through the generosity of Haley & Aldrich, Inc., a leading consulting engineering firm, and the family of Mr. James F. Haley, a distinguished civil engineering graduate and a member of the Class of 1939. The income from the fund is used to assist deserving students majoring in civil engineering who display soundness of character, a stable academic record, and financial need.

Donald F. Harding Scholarship *College of Business Administration* This scholarship, honoring the memory of Donald F. Harding, was established in 1990 through the generosity of Charlotte B. Smith, a distinguished alumna of the College of Business Administration and a member of the Northeastern University Corporation and Board of Trustees. Income is awarded annually to two students enrolled in the College of Business Administration who are among the top ten Finance Concentrators based on

grade point average. Recipients will be selected in their junior year and must demonstrate a high caliber of achievement as well as interest, extracurricular activities, and performance in the investments field.

Priscilla E. Hargreaves Scholarship *College of Engineering—Electrical Engineering* The Priscilla E. Hargreaves Scholarship for Electrical Engineering Students was established by her husband, William Hargreaves, E'28, as a loving tribute to a wife whose love and devotion meant so much to him. Income from this fund is awarded to electrical engineering students in their second year, who show a need and demonstrate reasonable academic responsibility.

Charles W. Havice Scholarship *All Colleges* This scholarship was established by the members of the Student Union upon the retirement of the former Dean of Chapel, Charles W. Havice. The income from the fund is awarded annually to upperclass students who are active in the Student Union. Students should demonstrate financial need.

Charles Hayden Memorial Scholarships *All Colleges* The Charles Hayden Foundation, created by the will of the late Charles Hayden, an alumnus of Boston English High School, offers annual scholarships to first-year students. The scholarships are awarded to "deserving boys" whose parents are unable to finance the entire cost of their education.

Frederic T. Hersey Scholarship *All Colleges* This fund was established in 1990 by a gift from Frederic T. Hersey, a 1956 graduate of the College of Business Administration, member of the Northeastern University Corporation and Board of Overseers, and a former Chairman of The National Council. This award will be made annually to a full-time, undergraduate day student who demonstrates academic stability, financial need, and soundness of character.

David Hesketh Scholarship Fund *All Colleges* This fund was established in 1987 by Stanley Hesketh, Jr., a 1976 graduate of University College, in loving tribute to his brother David, a graduate of the College of Engineering, Class of 1972. The income from this fund is awarded annually to students who have worked at the University in providing service to handicapped college students attending Northeastern. The recipients must demonstrate financial need, and preference will be given to students majoring in health-care professions.

Paul E. Hirshson Byline Scholarship Fund *College of Arts and Sciences—School of Journalism* This fund was established in 1990 in memory of Paul E. Hirshson with an endowment provided by his widow, Roberta Star Hirshson, and through the generosity of family, friends, and professional colleagues. The fund is a living memorial to a man of courage and character who shared his life and values with those around him and, through his work, influenced many people in positive ways. A 1963 graduate of the College of Liberal Arts, Paul E. Hirshson was a dedicated and diligent reporter and editor for the *Boston Globe*. Known for covering the Cambridge beat and for his "Names and Faces" column, Mr. Hirshson's commitment to the principles of good journalism, fair and balanced reporting, and concern for professional ethics and journalistic integrity was reflected daily in his work and set a standard for others to emulate. Income from the scholarship fund is awarded annually to worthy undergraduate or graduate students enrolled in the School of Journalism who have demonstrated financial need, academic achievement, and a concern for professional ethics.

Oscar and Zelia Hodgkins Memorial Scholarship *Boston-Bouvé College of Human Development Professions* The Oscar and Zelia Hodgkins Memorial Scholarship Fund, established in 1986, provides financial assistance to students enrolled in Boston-Bouvé College who demonstrate financial need and academic achievement. This scholarship is awarded annually to an entering freshman and will continue for each subsequent year as long as the student remains in Boston-Bouvé College and demonstrates normal academic progress.

Harold D. Hodgkinson Scholarship Fund *All Colleges* This scholarship was established in 1990 through a bequest of Harold D. Hodgkinson, former chairman of the Executive Committee of Wm. Filene's Sons Company. Mr. Hodgkinson served as a member of the Northeastern University Corporation since 1945 and as a Trustee since 1964 until his death in 1979. The income from this fund is awarded annually to worthy and deserving students.

Kathryn S. Horbal Scholarship *College of Engineering—Chemical Engineering* The Kathryn S. Horbal Scholarship for female chemical engineering students was established by Kathryn's family as a loving tribute to a daughter whose short lifetime meant so much to so many. Income from this fund is awarded to female chemical engineering students who have reached at least their middler year and who have demonstrated academic responsibility.

Richard Melvin Horwitz Memorial Award for Excellence in Electrical Engineering *College of Engineering—Electrical Engineering* The Richard Melvin Horwitz Memorial Award for Excellence in Electrical Engineering was established in 1967 by Leonard J. Horwitz in memory of his brother, Richard Melvin Horwitz, a member of the Class of 1945 in the College of Engineering who died in action during World War II. The award recognizes academic achievement and excellence and is given annually to an outstanding senior majoring in electrical engineering.

Walter F. Howe Memorial Scholarship *College of Business Administration* This fund was established in memory of Walter F. Howe, Class of 1968, who, within one week after graduation, was fatally wounded while pursuing thieves who had stolen his landlord's car. The scholarship was established by Walter's friends and relatives in memory of his ideals of good citizenship and civic responsibility. It is awarded annually to a student in the College of Business Administration who demonstrates financial need, good citizenship, and civic responsibility. The scholarship is open-ended, so that additional sums can be

added to it in future years, and is awarded by the University without restrictions as to race, color, geographic origin, or scholastic attainment.

Edward L. Hurtig Scholarship *All Colleges* This scholarship was established in 1968 through the generosity of the Hurtig family in memory of Edward L. Hurtig, an alumnus of the College of Engineering, Class of 1946. The scholarship is awarded annually to an entering freshman in the day colleges who has demonstrated the need for financial aid. Preference is given to recipients of the Supplemental Educational Opportunity Grants Scholarship Program of the United States Office of Education.

Maurice A. and Nellie L. Idelson Award *All Colleges* This award, established in 1968, is given annually to an entering freshman in the day colleges who has demonstrated the need for financial aid. Preference is given to graduates of the Boston English High School. Should there be no qualified candidate from this source, the award is then given to any worthy student.

Jamaican Associates, Inc., Scholarship *All Colleges* The Jamaican Associates, Inc., Scholarship, established in 1981 by the Jamaican Associates, Inc., is awarded annually to a student who is either a citizen of Jamaica who intends to return to Jamaica upon graduation or of Jamaican descent. Preference is given to a second-year student with demonstrable financial need and proven academic performance.

George and Florence R. Jamieson Scholarship Fund *College of Business Administration* This fund was established in 1984 through the generosity of George Jamieson in the name of his parents. The donor majored in accounting, graduated with the Class of 1959, and has used his preparation at Northeastern to distinguish himself with the firm of Price Waterhouse & Co., where he is a partner. The income from his gift is used to assist deserving students majoring in business administration who display soundness of character, a stable academic record, and financial need. Preference is given to students majoring in accounting.

Joseph Anthony Johnson Scholarships *College of Engineering—Mechanical Engineering* Established in 1968 by the will of the late Joseph Anthony (Johansen) Johnson of the Class of 1928, the income provides scholarship aid for students enrolled in the Department of Mechanical Engineering, with preference given to students of Scandinavian origin.

Ralph P. Johnson Scholarship Fund *Electrical Engineering and Computer Science* Administered by the Office of Financial Aid and awarded to a computer science or electrical engineering major, this fund was established in 1980 by David R. Johnson, an alumnus of the Class of 1970, in honor of his father. It is the donor's desire that recipients of this fund assume the moral obligation to reimburse the fund in future years as they may be able in order to make additional financial aid available for other students.

Kerkor Kassabian Athletic Training Endowed Scholarship Fund *All Colleges* This fund was established in October 1986 by relatives, friends, and former students of Kerkor (Koko) Kassabian, whose name was synonymous with athletic training in New England. Koko, the head athletic trainer at Northeastern from 1953 to 1965, was a member of the Northeastern University Varsity Club Hall of Fame and the National Trainer's Association Hall of Fame and an associate professor of Health, Sports, and Leisure Study at the University, where he also directed the athletic training curriculum. The income from the fund is awarded to students pursuing a Bachelor of Science in Education degree with a specialization in athletic training.

Morris S. Kay Scholarship in Engineering *College of Engineering* This scholarship was established in 1990 in honor of Morris S. Kay, a College of Engineering graduate of the Class of 1929, by Stephen B. Kay E'62. This tribute from a son to his father provides financial assistance to upperclass students in the College of Engineering based on need and demonstrated academic performance.

Dr. LeRoy C. Keagle Memorial Scholarship Fund *College of Pharmacy and Allied Health Professions* The Dr. LeRoy C. Keagle Memorial Scholarship Fund was established in 1975 through the generosity of family and friends of Dr. LeRoy C. Keagle, a man of high integrity and commitment to the profession of pharmacy who, at the time of his death on December 15, 1974, was dean of the College of Pharmacy and Allied Health Professions at Northeastern University. The income from this scholarship fund is awarded annually to a student in the undergraduate pharmacy program who is entering the junior or senior class. Recipients must demonstrate financial need, academic stability, and soundness of character.

Robert G. Keene Memorial Scholarship Fund *All Colleges* This fund was established in 1979 in memory of Robert G. Keene, a graduate of Lincoln College, Class of 1972. The endowment funds were provided by the friends and associates of Robert G. Keene and by the Polaroid Corporation, where he served as an engineering manager. The income from the fund is awarded annually to an undergraduate student who demonstrates financial need as well as strong character and initiative. Primary consideration is given to children of Polaroid employees.

Eunice Kenyon Memorial Scholarship Fund *All Colleges* This fund was established in 1985 by the family of the late Eunice Kenyon, an outstanding and dedicated professional in the field of blindness and special education. Income from the fund is awarded annually on the basis of financial need to a blind student or a student preparing for the field of medicine with emphasis on treating the blind.

Virginia DeVaux Kerr Scholarship *College of Engineering/College of Nursing* This fund was established in 1984 through the generosity of George R. DeVaux. Mr. DeVaux graduated from the College of Engineering with the Class of 1963. His gift established this fund in honor of his mother, Virginia

DeVaux Kerr, to benefit those students majoring in engineering or nursing who display soundness of character, a stable academic record, and financial need.

Martin Luther King, Jr., Scholarship *All Colleges* The Martin Luther King, Jr., Scholarship is granted annually to incoming freshmen, graduate, and transfer minority students who have demonstrated the philosophy of peaceful coexistence and change through nonviolent means espoused by Dr. King and who have an above-average scholastic record. The scholarship, in the amount of \$500, requires a minimum quality-point average. Financial aid based on need is available to supplement the scholarship.

Andrew C. Knudsen Memorial Scholarship *College of Engineering* The Andrew C. Knudsen Memorial Scholarship was established in 1982 by Johanna M. Knudsen in memory of her beloved brother, Andrew C. Knudsen, LI'52, B'55, who passed away on April 14, 1978. The scholarship award is to be made annually to two students, preferably one in the College of Engineering and one in the Alternative Freshman-Year Program, who have demonstrated leadership qualities, have proved worthy, and are of good character. Based on financial need, the awards are made annually from the income of the fund.

Vena Morse Lamson Scholarships *All Colleges* These scholarships are provided through the income of a fund established in 1963 by Horatio W. Lamson in memory of his beloved wife. They are awarded annually to needy and worthy students who are enrolled in any of the Basic Colleges of the University. The scholarships are granted by the Committee on Financial Aid of the University without regard to national origin, sex, race, or creed.

Irving Landfield Scholarship *All Colleges* This fund was established in 1972 through the generosity of Irving Landfield, a graduate of the School of Commerce and Finance of Northeastern University, Class of 1923. The income from the fund is awarded annually to deserving and needy students who demonstrate a desire to fulfill the limits of their ability in academic and cooperative periods of study. The income from this fund is administered and awarded by the University without restriction to race, color, creed, geographic origin, or scholastic attainment. It is Mr. Landfield's desire that recipients of the scholarship assume a moral obligation to contribute to the principal of this fund, as they may be able, in order to make additional financial aid available for other students in later years.

George M. and Irene M. Lane Scholarship Fund *All Colleges* This scholarship fund was established in 1979 by the family of Dr. George M. Lane to honor his memory. Dr. Lane's faithful and dedicated service to Northeastern extended from 1943 to 1975, at which time he retired as director of University Health Services. The income from the fund is awarded annually to an upperclass member of the University's varsity football or hockey team who demonstrates financial need, academic stability, and soundness of character. Family gifts as well as contributions from friends and associates may be added to the scholarship's endowment.

Avrom Aaron Leve Memorial Scholarship *College of Arts and Sciences—Psychology* This scholarship fund was established in 1957 in memory of Dr. Avrom Aaron Leve, former assistant professor of psychology. The interest is used annually to provide scholarships for upperclass students majoring in psychology. The award is made on the basis of academic achievement, financial need, and character.

Austin T. and June Rockwell Levy Scholarship *All Colleges* This fund was established in 1984 through the generosity of the June Rockwell Levy Foundation to assist deserving Rhode Island undergraduate students with tuition and living expenses. The fund memorializes the concern for the welfare of Rhode Island residents that was shared by Austin T. Levy, an innovator in business and philanthropy, and his wife, June Rockwell Levy.

William F. Linskey Scholarship Fund *All Colleges* This fund was established in March 1980 by alumni and friends of William F. Linskey, an athletic trainer long associated with young athletes in and around the Greater Boston area. A former head trainer for the Northeastern University football team and head hockey coach during the 1942–43 season, Linskey served the City of Cambridge School Department as head athletic trainer and physical therapist for more than 30 years. The income from the fund is awarded to worthy students pursuing courses leading to a Bachelor of Science in Education with a specialization in athletic training.

Russell T. Lowe Memorial Scholarship Fund *College of Engineering—Mechanical Engineering* This fund was established in 1976 in memory of Russell T. Lowe, a graduate of the College of Engineering, Class of 1953. The endowment funds were provided by the friends and associates of Russell Lowe and by the Barry Wright Corporation, where he served as a member of the board of directors and as president of the Industrial and Aero Products Group. The income from the fund is awarded annually to one or more upperclass students enrolled in the College of Engineering. Preference is given to mechanical engineering majors on the basis of demonstrable financial need and above-average scholastic achievement.

Edward J. Lynn Scholarship *College of Business Administration—Accounting* This fund was established in 1984 in honor of Edward J. Lynn upon his retirement by friends and associates and by The Continental Group, where he served as controller. Mr. Lynn was responsible for establishing the extensive cooperative education relationships between Northeastern University and his company. The income from the fund is awarded annually to an upperclass student enrolled in the accounting program of the College of Business Administration. Preference is given to students who demonstrate financial need and above-average scholastic achievement.

George A. MacConnell Scholarship *College of Business Administration* This scholarship was established in 1986 by George A. MacConnell, a 1971 graduate of the Northeastern University College of Business Administration and a senior vice president of Georgia-Pacific Corporation, where he began his employment in 1971. The income from this scholarship fund is awarded annually to upperclass College

of Business Administration students participating in the Cooperative Plan of Education who demonstrate financial need and academic stability.

Gilbert G. MacDonald Scholarship *All Colleges* This scholarship was established in 1981 by the family of Gilbert G. MacDonald, former vice president for student affairs and dean of students, and the members of the Student Union. The income from the fund will be awarded annually to upperclass students of proven ability and demonstrable financial need. Preference is given to students who participate actively in the Student Union.

Anna & Helen MacFarland Memorial Scholarship *Boston-Bouvé College of Human Development Professions* This fund was established in 1990 by the will of Helen MacFarland, who received a master's degree from the Graduate School of Education in 1956. The income is used to provide full-tuition scholarships to worthy and financially needy students committed to careers in the public school education of elementary or secondary school students in large urban areas. Recipients are known as MacFarland Scholars. This scholarship is a living memorial to Anna and Helen MacFarland, former teachers in the Boston public schools. Their lifelong interest and success in helping young people will continue through this award.

Mary E. MacKinnon Scholarship Fund *College of Arts and Sciences* This annual scholarship was established in 1987 by Robert J. MacKinnon, LA'60, as a loving tribute to his mother. The income from this fund is used to assist a sophomore student in the College of Arts and Sciences who is a U.S. citizen and a resident of Massachusetts, with a preference given to students who have resided in Quincy. The recipient will have demonstrated financial need and academic ability during his or her freshman year at Northeastern University.

Davies Semple Maddock Health Scholarship *All Colleges* This fund was established by A. Thomas Maddock chE '42, Lilian Semple Maddock, and Robert T. Maddock chE '72, to provide financial assistance to undergraduates enrolled in a cooperative education baccalaureate program in nursing, medical laboratory science (medical technology), respiratory technology, or psychology major. Scholarships are awarded annually with a minimum of \$500 and a maximum of one year's tuition. The purpose of the fund is to provide needed financial assistance to students with average or above average scholastic attainment, who have participated in physically active sports. Recipients should have sound basic character, potential for future development, creativity, and a desire to achieve. The fund will accept unconditional additional contributions.

Ann Marie Maida Memorial Football Scholarship Fund *All Colleges* This scholarship was established by Vito and Lucy Maida in memory of their beloved daughter, Ann Marie, as a tribute and expression of their love for her and her dedication to her teaching career. Ann Marie passed away in December 1988. This scholarship is awarded annually to a deserving football player who demonstrates financial need, academic stability, and the soundness of character that best exemplifies the Northeastern University athlete.

James F. and Catherine Hynes Manning Memorial Scholarship Fund *College of Engineering* This fund was established in 1990 by Dr. John Hynes Manning, an honor graduate in civil engineering, Class of 1939, and his wife Roselle V. Manning. The income from this fund will be used annually to provide financial assistance to new students seeking admission in the College of Engineering. Applicants must have satisfactory records of scholarship as of the time of application, demonstrable need, and soundness of character. Preference will be given to accepted applicants from the Republic of Ireland and then to those of Irish origin.

Dr. Reuben J. Margolin Memorial Scholarship Fund *Boston-Bouvé College of Human Development Professions* The Dr. Reuben J. Margolin Memorial Scholarship Fund was established in 1973 through the generosity of family and friends of Dr. Reuben J. Margolin, an outstanding and dedicated individual and friend who, at the time of his death on April 6, 1972, was chairman of the Department of Rehabilitation and Special Education at Northeastern University.

The income from the fund is awarded annually to a deserving student admitted to or enrolled in the Graduate School of Boston-Bouvé College of Human Development Professions and majoring in rehabilitation and/or special education. Recipients must demonstrate financial need as well as the personal and professional qualities exemplified by Dr. Margolin.

Peter J. Martin Scholarship Fund *College of Business Administration* This fund was established in 1956 under the provisions of the will of Peter J. Martin, a 1949 graduate of the Northeastern University School of Business. Mr. Martin designated that the income of this fund should be used to provide financial assistance to upperclass students of proven ability and demonstrable financial need in the College of Business Administration.

George T. Marvin Scholarship Fund *All Colleges* This fund was established in 1961 under the provisions of the will of George T. Marvin, a graduate of the Northeastern University School of Law, Class of 1918. Mr. Marvin designated that the income of this fund be used to provide financial assistance to worthy and needy students to assist them in furthering their education at Northeastern.

George T. Marvin scholarships may be awarded to new students seeking admission to Northeastern and to freshman and upperclass students. Applicants must have satisfactory records of scholarship and must demonstrate genuine need and good citizenship.

Merchants Tire Company Scholarship Fund *College of Business Administration* This scholarship was established in 1972 by Merchants Tire Company in honor of Max Katz, a Class of 1917 alumnus and founder and chairman of the board of Merchants Tire Company. The scholarship is awarded annually

with selection preference given to children of current Merchants Tire Company employees enrolled as freshmen within the College of Business Administration who demonstrate financial need, soundness of character, and academic stability.

Dean Constantine N. Meriano Memorial Scholarship *College of Pharmacy and Allied Health Professions* This scholarship, established by the Class of 1950 of the New England College of Pharmacy and subsequently supported by all classes of the New England College of Pharmacy and the Northeastern University College of Pharmacy and Allied Health Professions, is named to honor the memory of Constantine N. Meriano, who was the founder, dean, and chief executive officer of the New England College of Pharmacy until his retirement in 1957. In 1962, the New England College of Pharmacy merged with Northeastern University, and it is now known as the College of Pharmacy and Allied Health Professions. The scholarship is awarded annually to one or more students of the College. Selection will be made by the Committee on Scholarships and will be based on financial need, academic stability, and soundness of character.

George H. Meserve, Jr., Scholarship Fund *College of Arts and Sciences* This scholarship was established in 1979 through the generosity of Robert W. Meserve in honor of his brother, Professor George H. Meserve, Jr., an alumnus of the Class of 1925. Professor Meserve served Northeastern faithfully and with distinction for 42 years, retiring in 1968 as professor and chairman of the Department of Art. Announced at the ceremony dedicating George H. Meserve Hall, this scholarship benefits worthy undergraduate students who are majoring in art. Recipients must demonstrate financial need, academic stability, and soundness of character.

Harash Mitroo Memorial Athletic Scholarship *All Colleges* This scholarship was established in 1983 through the generosity of the Mitroo family of New Delhi, India, in memory of Harash, a student in the College of Business Administration who was killed in an automobile accident in 1978. A talented artist and outstanding athlete, Harash received numerous awards for his paintings and for his athletic abilities, including a medal for his performance in an international cricket match against Ceylon.

This scholarship is awarded annually, with preference given to international students, to a member of the varsity men's intercollegiate team in basketball, football, hockey, or track, who demonstrates financial need, soundness of character, and a spirit of good sportsmanship and fellowship. A trophy, designated as the Harash Mitroo Memorial Trophy in Athletics and inscribed with the names of scholarship recipients, is on permanent display at the University.

Mobil Corporation Scholarships *All Colleges* During the 1991 Persian Gulf War, Mobil made a \$100,000 grant to Northeastern for scholarships for men and women who served on active military duty during Operation Desert Shield and Operation Desert Storm, and to their spouses and children. Recipients must be admitted to Northeastern to pursue a full-time course of undergraduate study leading to a bachelor's degree. Scholarships range from \$1,000 to \$5,000 and may be renewed annually to students in good standing.

Donald H. Moore Scholarship *College of Engineering* This scholarship was established in 1989 by Donald H. Moore, a 1948 graduate of the College of Engineering. The income from this fund is to be used to provide financial aid to entering freshmen in the College of Engineering with preference to graduates of Quincy (Mass.) High School.

Clyde W. Morrison Scholarship Fund *All Colleges* The Clyde W. Morrison Scholarship was established in 1974 by Clyde W. Morrison, a member of the Class of 1942. The scholarship is awarded annually to a Braintree resident enrolled as a freshman, with a demonstrable financial need. Selection is made by the Committee on Scholarships.

Morse Shoe, Inc., Scholarship Fund *College of Arts and Sciences* This fund was established in 1984 by Morse Shoe, Inc. Endowment income is used to provide scholarship assistance for an undergraduate who demonstrates financial need, academic stability, and soundness of character. Preference will be given to students from Massachusetts.

Frederick W. Muckenhaupt Scholarship *All Colleges* This award was established in 1961 by Dr. and Mrs. Carl F. Muckenhaupt in memory of their son, Frederick W. Muckenhaupt, Class of 1959 of the College of Engineering. The award is made annually to a student in good standing on the basis of need. Preference is given to a student enrolled in the Department of Electrical Engineering.

Muro Pharmaceutical, Inc., Scholarship *College of Pharmacy and Allied Health Professions* This annual scholarship was established in 1985 through the generosity of George D. Behrakis (Pharmacy '57), president, and his wife, Margo. The fund is restricted to students in their middle, junior, or senior years who are pursuing the degree of Bachelor of Science in Pharmacy. Recipients must have demonstrated high academic ability and financial need.

Victoria L. Namin Memorial Scholarship *College of Pharmacy and Allied Health Professions* This fund was established in 1990 by the Namin family of Southeastern Connecticut to honor Victoria L. Namin, a 1980 Pharmacy graduate. Miss Namin was a dedicated professional who exhibited a zest for life, a love for family, and a concern for the advancement of women. This scholarship is awarded annually to a financially deserving woman student enrolled in the Pharmacy program, with preference to middlers, juniors, and seniors.

Elizabeth A. Neilson Scholarship *Boston-Bowd College of Human Development Professions* This fund was established in 1976 in memory of William H. and Anastasia Neilson, exemplars of the profession of health education during their lifetimes. The income from the scholarship fund is awarded annually to a student or students with the highest scholastic record majoring in health education, who have com-

pleted eight quarters of academic study, with at least four quarters having been taken at Boston-Bouvé College of Human Development Professions. The student(s) must typify the philosophy of the health education profession.

Sean Patrick O'Rourke Memorial Scholarship Fund *College of Arts and Sciences—Political Science Majors* This scholarship was established in 1989 through the generosity of Lawrence A. and Carole A. O'Rourke in memory of their son, Sean Patrick O'Rourke, a Class of 1990 junior majoring in political science who was killed in an automobile accident in June 1989. Sean entered Northeastern in the fall of 1986 and had a great interest in the College of Arts and Sciences and political science. The income from the fund is awarded annually to juniors or seniors with a major in political science who display soundness of character with proven ability and demonstrable financial need. The award or awards will be designated by the Dean of the College of Arts and Sciences in conjunction with the Director of Financial Aid.

Shaun Ouillette Memorial Scholarship Fund *College of Criminal Justice* Established in the memory of Shaun Ouillette, a 14-year-old Canton boy murdered in 1986 by a classmate, this scholarship fund is designed to provide tuition assistance at the College of Criminal Justice to an incoming freshman. Reflecting what were Shaun's aspirations, preference is given to a student who is pursuing a career in law enforcement.

Thomas Anthony Pappas Scholarship Fund *All Colleges* This fund was established in 1980 by the Thomas Anthony Pappas Charitable Foundation. Endowment income is used to provide scholarship assistance to needy students with high scholastic records.

Mary Alice (King) Parsons Memorial Scholarship Fund *School of Journalism* This fund was established in 1985 in memory of Mary Alice (King) Parsons, who graduated with high honors in journalism with the Class of 1971. Her writing and contributions to her profession and to those who knew her are recognized by the generous gifts that established this endowment. The income from this fund is awarded annually by the School of Journalism to deserving journalism majors who display professional promise and soundness of character. Preference is given to female students.

M. F. Patrick Scholarship Fund *All Colleges* This scholarship fund was established in 1987 by a bequest from Hilda Winslow, a 1916 graduate of Boston-Bouvé College, to provide financial assistance to students who demonstrate financial need, academic promise, and soundness of character and who either were born in or reside in Provincetown, Massachusetts.

Amelia Peabody Honors Scholarships *All Colleges* This endowment was established in 1988 by the Amelia Peabody Charitable Fund to benefit students in the University Honors Program. These scholarships are especially meaningful to Northeastern because Miss Peabody was a generous benefactor and a dear friend of the University. She was the first woman to serve on the Northeastern University Corporation and Board of Trustees. A talented sculptress, Miss Peabody was awarded an honorary Doctor of Fine Arts degree by the University in 1965 in recognition of her artistic talents and humanitarian contributions.

Power Systems Engineering Grants-in-Aid *College of Engineering—Electrical Engineering* A number of public utilities and power equipment manufacturing companies in the Northeast have made available grants-in-aid ranging from \$1,000 to \$5,000 to assist able freshmen who are interested in pursuing careers in power systems engineering through study programs leading to the bachelor of science or master of science in electrical engineering. Awards are made on the basis of academic achievement in high school and aptitude for, and interest in, the field of power systems engineering, without regard to financial need. Candidates should apply to the Dean of Admissions not later than March 1 of the year in which they wish to enter the College of Engineering.

Lawrence Harlow Pratt Athletic Scholarship Fund *All Colleges* This fund was established in 1979 by the Northeastern University Varsity Club in conjunction with the Athletic Development Program Fund Drive to honor Lawrence Harlow Pratt. For more than four decades, Larry was the spirit of Northeastern athletics. His greatest joys were the young men he persuaded to attend college. He encouraged them, cajoled them, sometimes scolded them, but always inspired them to complete their intercollegiate careers and go on to become outstanding members of the community. The income from the fund is awarded annually to a financially deserving varsity athlete(s).

Charles Protaps Endowment Fund *All Colleges* This fund was transferred to Northeastern University in 1983. It was established through the will of Charles Protaps, a Lithuanian immigrant who became a common laborer in this country. The purpose of the fund is to aid men and women of Lithuanian extraction to acquire a higher education. The income of this fund is used to provide low-interest loans of up to \$500 to needy and gifted students of Lithuanian extraction who are pursuing a degree program at Northeastern University. Interest of 5 percent will begin to accrue when the student either withdraws or graduates from Northeastern.

Gay Miller Reese Memorial Scholarship *Boston-Bouvé College of Human Development Professions* The scholarship was established in 1971 by Everett Reese, in memory of his wife, and by members of the Class of 1921 at their 50th reunion in honor of their classmate and class president, Gay Miller Reese. This scholarship is awarded annually to help a well-qualified upperclass student in Boston-Bouvé College of Human Development Professions acquire an education that could not otherwise be possible. The recipient of this award is selected by the Committee on Scholarships.

Regional Scholarships *All Colleges* Secondary school students who reside in rural areas of New England, who have demonstrated superior achievement in their studies, and who are strongly endorsed by their

principals and guidance counselors may qualify for a Regional Scholarship. Scholarships range from \$200 to \$1,400.

Myer Riesman Scholarship *College of Nursing* This fund, established in 1969 in memory of Myer Riesman, is used to provide financial assistance to deserving students in the College of Nursing. Preference is given to those students whose clinical experience is at Beth Israel Hospital.

Edward T. Rigney Scholarship *All Colleges* A fund was established in 1978 by a grant from the Trans-Sonics Foundation in memory of Edward T. Rigney, member of the Class of 1941 and co-founder of Trans-Sonics, Inc. Income is awarded annually to a student showing financial need and promise of success in his/her chosen field and who is enrolled in engineering, science, or science-related studies. The scholarship may be granted to a freshman or upperclass student and may be renewed in succeeding years.

Daniel J. and Elinor M. Roberts Endowed Athletic Scholarship Fund *All Colleges* This scholarship was established by the Northeastern University Varsity Club and friends of Daniel J. Roberts as a tribute and expression of gratitude for over 40 years of service to Northeastern University.

Daniel J. Roberts, Sr. Vice President—Treasurer, Northeastern University, Class of 1948—Daniel J. Roberts joined the faculty of Northeastern University in 1948 as an instructor of accounting and as Assistant to the Director of Student Activities. Mr. Roberts held positions as Business Manager, Assistant Director of Athletics, Director of Students and Veterans' Accounts, Bursar, Comptroller, and Director of Finance. In 1969 he was named Vice President of Finance and in 1979 elected Treasurer of Northeastern University.

Isedore Rosenthal Fund *College of Business Administration* The Isedore Rosenthal Fund was established in 1981 by Mrs. Isedore Rosenthal and friends in memory of her husband, a distinguished graduate of the School of Commerce and Finance (1925) and the School of Law (1931). Income from the fund is awarded each year, on the basis of financial need, to freshman accounting majors for the purchase of books and materials. It is the donor's desire that recipients assume the responsibility in future years to contribute to the principal of this fund, as they may be able, in order to make additional resources available for other students in later years.

Thomas A. Rosse Scholarship *College of Arts and Sciences/College of Engineering* The Thomas A. Rosse Scholarship was originally established in December 1979 by the generosity of the Thomas A. Rosse family. The scholarship is awarded annually to science or engineering male student athletes who demonstrate financial need, academic stability, and soundness of character.

Susan M. Russell Scholarship *All Colleges* The fund was established in 1988 through the generosity of Sidney L. Russell, of Lynn, Massachusetts, in memory of his wife. Income from the fund is awarded to juniors or seniors who demonstrate academic promise and good character but require financial assistance to achieve their educational potential.

Frank B. Sanborn Scholarship Fund *College of Engineering* The fund was established in 1958 to provide a scholarship or scholarships of not more than \$500 to worthy and needy students selected by the University, without restrictions as to race, creed, or geographic origin, but with preference to students majoring in electrical, mechanical, civil, or industrial engineering, in the order stated. Recipients must be willing to assume a moral obligation to reimburse the fund, as they may be able, to make similar financial aid available for other students in later years. There shall be no interest charged and no time specified for reimbursement.

Caroline M. and William J. A. Schafer Scholarship *All Colleges* This scholarship fund was established in 1988 by William T. Schafer, B.A., '31, in honor of his parents. Endowment income is to be used to provide scholarship assistance to needy students who demonstrate financial need, soundness of character, and academic stability.

Helen Seamans Schafer Scholarship *College of Business Administration* The Helen Seamans Schafer Scholarship Fund for business administration students was established by William T. Schafer, B.A., '31, as a tribute to his wife, Helen, whose love and devotion meant so much to him. Income from this fund is awarded to upperclass students in the College of Business Administration. Consideration is based on financial need, academic stability, and soundness of character.

Arnold E. Schaier Scholarship *College of Engineering* This fund was established in 1989 by Peter P. Saunders, '57, and John F. Toomey, '62, to honor the founder of the Norwood Engineering Company, Arnold E. Schaier '30, who first employed them as co-op students. In the spirit of the type of employees Mr. Schaier sought, this award will be made to a student enrolled in the College of Engineering who demonstrates integrity, initiative and eagerness to learn, a generous nature, and loyalty. Students should also show academic stability and financial need. The award will be made annually by the Awards Committee of the College of Engineering.

Clinton H. Scovell Scholarships *Boston-Bouvé College of Human Development Professions* Scholarships are made available to men and women students in Boston-Bouvé College of Human Development Professions through a fund provided by the will of Clinton H. Scovell.

Joseph M. Segel Scholarship *All Colleges* This scholarship fund was established January 9, 1981, by Martin F. Walsh, '52, and his wife, Pauline, to honor Joseph M. Segel on the occasion of his birthday. In 1964 Mr. Segel founded the Franklin Mint, which today is the nation's largest privately owned mint. The entrepreneurial ethic of Mr. Segel is much the same as that demonstrated by many Northeastern alumni. Therefore, it is Mr. Segel's desire that recipients of this award demonstrate this quality and also show financial need.

Sidney L. Sholley Memorial Scholarship *All Colleges* The Sidney L. Sholley Memorial Scholarship has been established in memory of the founder and first president of Keystone Custodian Funds, Inc. Each year the trustees of the Sholley Foundation, Inc., provide a scholarship of \$3,500 to be awarded by the University to an outstanding incoming first-year student. The recipient is known as the Sidney L. Sholley Scholar.

George A. and Lorraine C. Snell Scholarship *All Colleges* This fund was established in 1973 by Mr. George A. Snell, a graduate of the College of Engineering, Class of 1941, and a member of the Northeastern University Corporation and Board of Trustees, and his wife, Lorraine C. Snell. The income from the fund is awarded annually to one or more students enrolled in the Basic Colleges of Northeastern University. Selection is made by the Committee on Scholarships on the basis of financial need, academic stability, and soundness of character.

Peter V. Sorgi Scholarship Fund *College of Business Administration* This fund was established in 1986 by Peter V. Sorgi, a graduate of the College of Business Administration, Class of 1943. Income from the fund will be awarded annually to one or more students enrolled in the College of Business Administration. Awards are based upon financial need, academic stability, and soundness of character.

John Stuart Sousa, Jr., Memorial Scholarship Fund *College of Pharmacy and Allied Health Professions* This scholarship was established in 1968 in memory of John S. Sousa, Jr., of Fall River, Massachusetts, a student in the College of Pharmacy, Class of 1969, by his family and friends. The scholarship is awarded annually with selection preference given to a senior in the College of Pharmacy and Allied Health Professions who has obtained a cumulative quality-point average of at least 2.3, demonstrates financial need, participates in extracurricular activities, and is, preferably, a member of a fraternity or sorority.

Southeastern Massachusetts Pharmaceutical Association Scholarship Fund *College of Pharmacy and Allied Health Professions* This scholarship was established in 1980 by the Southeastern Massachusetts Pharmaceutical Association. The income from the fund is awarded annually to one or more middle, junior, or senior students enrolled who are residents of the area covered by the Southeastern Massachusetts Pharmaceutical Association (Greater Fall River, Greater New Bedford, and the Cape Cod areas). Recipients must be pharmacy majors and must demonstrate financial need, academic stability, and soundness of character.

Lillian M. Spelman Memorial Scholarship *College of Nursing* This scholarship was established in 1979 by a bequest from Lillian M. Spelman, a resident of Boston who, as a public health nurse, dedicated her life to helping others. Her career began in the West End of Boston in the early 1900s. She served her country unselfishly as a Red Cross nurse in Europe during the First World War. Through this scholarship she continues to help others. Scholarship recipients must exhibit financial need as well as academic stability and soundness of character.

William M. and Ruth S. Stewart Scholarship Fund *College of Business Administration* This fund was established in 1990 by the family and friends of William and Ruth Stewart to provide an annual award to a student in the College of Business Administration, who has demonstrated both financial need and academic achievement. William Stewart was an administrator and professor in the evening division and was well known for his inspiring presentations on behalf of the University. He retired in 1972, after teaching sales and marketing and serving as evening division director of liberal arts, registrar, manager of the bookstore, and first purchasing director. Ruth Stewart received her education degree at Northeastern in 1956 and taught for many years in Quincy, Mass., before retiring to Florida.

Dr. Bernard A. Stotsky Clinical Service Award Fund *All Colleges* This fund was established in 1990 by Dr. Bernard A. Stotsky, who retired in 1989 after 28 years of service to Northeastern and its students as a faculty member and Chief Psychiatrist at the Lane Health Center. The income from the fund provides annual awards to students or employees who, through effective clinical service to the Lane Health Center, demonstrate the attitude, knowledge, and skill that lead to or exemplify meaningful careers in the "helping professions." The donor prefers that recipients be enrolled in the Physical Assistance Program, or be cooperative education students assigned to the Lane Health Center, or be employed at the Lane Health Center in a capacity other than physician or nurse.

Student Loan Fund—Health Professions *Boston-Bouvé College of Human Development Professions, College of Nursing, College of Pharmacy and Allied Health Professions* In 1974, a foundation established a perpetual loan fund at Northeastern University to benefit full-time students enrolled as middlers, juniors, and seniors in Boston-Bouvé College of Human Development Professions, the College of Nursing, and the College of Pharmacy and Allied Health Professions. This loan fund aids those students who have a substantial investment in and commitment to the health professions and who require some financial help to complete their preparation.

Student Loan Fund—Stop & Shop Companies, Inc. *All Colleges* Established in 1974 by the Stop & Shop Companies, Inc., the Student Loan Fund is a combination endowment and revolving fund to be funded by \$100,000. This generous gift recognizes the contribution, in human terms, made through the years by Northeastern to Stop & Shop, which at the time the Loan Fund was established counted more than 120 Northeastern men and women in its executive ranks, seven of them vice presidents. The Loan Fund assists students who have a substantial investment in their education but are in need of some financial stimulus to aid them in completing their work.

Ruth Page Sweet Scholarship Fund *Boston-Bouvé College of Human Development Professions* This fund was established in 1959 by members of the Class of 1919 and alumnae of the Boston-Bouvé School in honor of their classmate, Miss Ruth Page Sweet, dean of women in the school from 1929 to 1946,

administrative director from 1946 to 1948, and director from 1948 to 1958. The scholarship is presented to a junior or senior who has demonstrated a high level of professional promise indicated by academic record and extracurricular activities.

Frederick L. Tapper Scholarship Fund *All Colleges* This fund was established in 1987 by the wife and children of Frederick L. Tapper to commemorate his sixtieth birthday and his regard for Northeastern University. Mr. Tapper was accepted by Northeastern University in 1948 but could not attend because of a lack of funds. He did, however, achieve success in his own business and as a provider for his family. This fund was established as an expression of Frederick Tapper's admiration for Northeastern University and its mission to help students fulfill their goals, as he did. Scholarship awards from the fund are made to deserving undergraduate students who demonstrate financial need, soundness of character, and academic promise.

Sidney and Marilyn Tartarkin Scholarship Fund *All Colleges* This fund was established in 1986 in honor of Mr. Tartarkin's sixtieth birthday. Initial funds were provided by Sidney and Marilyn Tartarkin, with later contributions by family, friends, and associates. The income from the fund is awarded annually to one or more upperclass students participating in the Cooperative Plan of Education. Awards are given on the basis of demonstrable financial need, without regard to religion or race, and of an individual's desire to fulfill the potential of his or her academic ability. Preference is given to students who were without a father in junior and senior high school. It is the desire of the donors that scholarship recipients assume a moral obligation to add to this fund, as they may be able, in order to increase aid available in the future.

Alice Taylor Scholarship *All Colleges* Northeastern University recognizes that Alice Taylor, who passed away in 1982, is remembered as a positive force by the Mission Hill community and even more by the tenants of the Mission Hill Extension housing development. Because of Ms. Taylor's contributions, the University has made available to five freshmen who are residents of Mission Hill Extension full-tuition Alice Taylor Scholarships for the first year.

A. Gilbert Tenney Scholarship Fund *College of Engineering—Electrical Engineering* This fund is in memory of A. Gilbert Tenney, who served as a captain in the Air Force during the Korean War and was killed while in active service. Income from the fund is awarded to a needy student or students in the field of electrical engineering studying under the Cooperative Plan of Education.

Reginald C. Thomas Memorial Scholarship *Department of Biology* This fund was established in 1988 through the generosity of Mrs. Reginald C. Thomas and her son, Royce C. Thomas, as a memorial to Colonel Reginald C. Thomas, a 1941 graduate of the College of Arts and Sciences. A distinguished scientist and teacher, Reginald Thomas was responsible for establishing the microbiology laboratory at Northeastern University. Colonel Thomas's further scholastic undertakings, his teaching credentials, and his dedication to his chosen field were recognized in his appointment as the Director of Medical Intelligence, Office of the Surgeon General, U.S. Army, a position he held until his retirement in 1972. The scholarship is awarded annually to upperclass students majoring in biology and demonstrating financial need.

Almore I. Thompson Memorial Scholarship Fund *College of Business Administration* This fund was established in 1986 in memory of Almore I. Thompson, a graduate of the College of Business Administration, Class of 1938. Mr. Thompson was a member of the Northeastern University Corporation and also served as a director of the National Council. The endowment funds were provided by members of his family and by friends. Income from the fund is awarded annually to one or more students enrolled in the College of Business Administration on the basis of financial need and satisfactory academic performance.

Earl H. Thomson Memorial Scholarship *All Colleges* Established in 1971, this fund honors the memory of Earl H. Thomson, a distinguished alumnus of the Class of 1925. Mr. Thomson was an internationally known trademark attorney as senior partner in the firm of Thomson and Thomson. A member of the Northeastern Corporation since 1958 and a trustee of the University since 1960, he was also a director of the National Council, former president of the Northeastern Alumni Association, and a member of the board of directors of Nu Epsilon Zeta fraternity.

This scholarship is awarded annually to one or more deserving and needy students enrolled as freshmen and/or upperclass students who demonstrate a desire to fulfill the potential of their ability in academic and cooperative periods of study. The scholarship is open-ended so that sums can be added to it in future years, and it is administered and awarded by the University without restrictions as to race, creed, geographic origin, or scholastic attainment. It would be Mr. Thomson's desire that scholarship recipients assume a moral obligation to reimburse this or other scholarship funds, as they may be able, in order to make additional financial aid available for other students in later years.

James M. Thornton Memorial Football Scholarship Fund *All Colleges* This scholarship was established by friends of James M. Thornton and by the Northeastern University Varsity Club as a tribute and expression of their love for him. A 1967 graduate, Jim had a great interest in the athletic programs of Northeastern University, Madison Park, and Brookline High Schools. As an outstanding athlete, Jim played halfback on the undefeated 1963 Northeastern team and in 1982 was inducted into the University Hall of Fame. He was the athletic director and assistant headmaster at Madison Park High School prior to his death. Preference in awarding this scholarship is given to Boston high school and Brookline schoolboy athletes.

Oliver S. Titcomb Memorial Scholarship *College of Engineering* This scholarship was established in 1987 by Dr. and Mrs. Stanley C. Titcomb, son and daughter-in-law of Oliver, a member of the Class of 1925, College of Engineering. The scholarship is awarded annually to one or more freshman students enrolled in the College of Engineering with demonstrable financial need. Preference is given to students who come from the Greater Boston area.

Gerald F. Tonks Scholarship *All Colleges* This scholarship was established in 1986 under the provisions of the will of Gerald F. Tonks to benefit undergraduates who demonstrate satisfactory records of scholarship and genuine financial need. Mr. Tonks, who retired from Liberty Mutual Insurance Company in 1965 after 38 years of service, manifested a lifelong interest in and commitment to safety and health in the workplace. Scholarship awards, not to exceed 50 percent of the recipient's annual tuition, are made yearly to bachelor of science degree candidates enrolled in the College of Engineering and in selected departments within the College of Arts and Sciences and to Bachelor of Engineering Technology or associate in science degree candidates within the School of Engineering Technology.

Eliot F. Tozer Memorial Scholarship *College of Business Administration/College of Engineering* This fund was established in 1972 through the generosity of the members of the Class of 1931 in memory of their faculty adviser, Eliot F. Tozer. The \$750 scholarship is awarded annually to students of proven need in the middle, junior, or senior classes of the day colleges of engineering or business administration. The scholarship is open-ended so that sums can be added to it in future years; it is administered and awarded by the University without restrictions as to race or creed.

Charles Irwin Travelli Scholarships *All Colleges* Numerous scholarships have been given yearly since 1932 to students demonstrating financial need, high academic achievement, and an active interest in University life as shown by participation in one or more major activities. Students are usually honored as recipients of Travelli Scholarships at the completion of their freshman year. Under normal circumstances, these awards continue through the senior year.

Trustee Scholarships *All Colleges* Established in 1928 by the Board of Trustees of Northeastern University, these full- and partial-tuition scholarships are granted in the Basic Colleges each year to entering freshmen who have demonstrated superior scholastic attainment throughout their preparatory or high school courses.

Robert E. Turner Memorial Scholarship Fund *College of Business Administration* This scholarship fund was established in 1975 through the generosity of family, friends, and colleagues in memory of Robert E. Turner, a 1952 graduate of Northeastern's College of Business Administration, who was associated with the University for 18 years. The income from this fund is awarded annually to assist a College of Business Administration undergraduate student majoring in accounting who demonstrates financial need, academic stability, and soundness of character.

Samuel Ulman Scholarship Fund *All Colleges* This fund was established in 1960 by Mrs. Samuel Ulman in memory of Samuel Ulman, a student at Northeastern University from 1912 to 1915. The fund provides scholarship assistance to students in good academic standing who have financial need.

University Scholarships *All Colleges* Northeastern University has for many years maintained a scholarship fund for deserving, qualified students. These scholarships are awarded on the basis of need, scholastic standing, and campus citizenship. The recipient of a Northeastern scholarship must be willing to assume a moral obligation to repay the University at some future date.

UPS Foundation Scholarship Fund *College of Business Administration* This endowed fund was established in 1952 by the UPS Foundation, the sponsored foundation of United Parcel Services, Inc. The income from this fund is awarded annually to undergraduate students enrolled in the College of Business Administration who demonstrate financial need, academic stability, and soundness of character. In providing scholarships, preference is given to students majoring in the transportation concentration or planning to enter the transportation industry.

Jessica H. Valentine Memorial Scholarship Fund *College of Nursing* This fund was established in 1985 through the generosity of the family and friends of Jessica H. Valentine, a former College of Nursing student. The income from the fund is awarded annually to a student at the college who demonstrates financial need and academic stability.

R. G. Vanderweil Engineers Scholarship *College of Engineering* Established in 1990 by R. G. Vanderweil Engineers, Inc. in memory of R. G. Vanderweil, Sr., founder of the company, the scholarship will be awarded each year to a disadvantaged student from the City of Boston interested in the design of mechanical/electrical systems in buildings. Preference will be given to students with outstanding academic records who demonstrate financial need.

Varsity Club Hall of Fame Scholarship Fund *All Colleges* This scholarship was endowed by the Varsity Club with an initial gift of \$5,000 in 1987. The scholarship is awarded annually to a deserving athlete who demonstrates financial need, academic stability, and the soundness of character that best exemplifies the Northeastern athlete.

Sabestino Volpe Scholarship Fund *College of Engineering—Civil Engineering* The fund was established in 1972 through the generosity of Sabestino Volpe, a distinguished alumnus of the College of Engineering, Class of 1928. The income from the fund is awarded annually to an upperclass student in the day civil engineering degree program within the College of Engineering. Recipients must demonstrate financial need, academic stability, and soundness of character.

Michael F. Warchol Memorial Scholarship *College of Engineering* The scholarship was established in 1989 by Julia A. Warchol in loving memory of her husband, a 1936 graduate of the College of Engineering. Annual awards are made to upperclass students on the basis of financial need and academic promise. Preference is given to electrical engineering students who come from families of Polish descent or are graduates of Haverhill (Mass.) High School.

Henry Ellis Warren Scholarship Fund *All Colleges* This endowed fund was established in 1981 by the Warren Benevolent Fund, Inc., to honor the memory of Henry Ellis Warren of Ashland, Massachusetts. The income from this fund is awarded annually to undergraduate students who demonstrate financial need, academic stability, and soundness of character. In providing scholarships, preference is given to students from Ashland or contiguous communities.

Jacob Wasserman Scholarship *College of Pharmacy and Allied Health Professions* Established in 1966 by his friends in memory of Jacob Wasserman, this fund is to provide scholarship aid to a senior student in the College of Pharmacy and Allied Health Professions. The award will be made annually on the basis of financial need, academic performance, and personal qualities.

WCVB Boston Scholarship for a Minority Student in Broadcast Communication *College of Arts and Sciences* This scholarship was established in 1984 by WCVB-TV Boston. The income from the fund is awarded annually to a junior, senior, or graduate minority student in broadcast communication, with preference given to an African-American, Spanish, Oriental, or American Indian student who is economically disadvantaged and to individuals who are residents of the New England states. The recipient must be an American citizen and taking courses in newswriting and/or TV news production and other required journalism courses. The scholarship is administered by the School of Journalism in conjunction with the Office of Financial Aid.

Mark Caldwell Whitney Memorial Aviation Scholarship Fund *College of Engineering* Established in 1981 by the family and friends of the late Mark Caldwell Whitney, an outstanding 1973 graduate of the Aeronautical Technology Program. Income from the fund is awarded annually to a student with financial need who exemplifies Mr. Whitney's love of flying and commitment to excellence in the aviation field.

Edward R. Willett Fund *College of Business Administration* This fund was established in 1986 by Dr. Edward R. Willett, retired professor of finance, who served on the faculty of the College of Business Administration for 38 years. Financial aid awards are to be made annually to students majoring in finance who demonstrate academic achievement.

Window Shop Scholarship Fund *All Colleges* This fund was established in 1988 through the generosity of the Window Shop Scholarship Committee. The Window Shop organization was created in 1939 by a small group of talented and enterprising Cambridge, Massachusetts women, who wanted to assist refugees from Germany and Austria by providing language- and job-skills training and employment. By 1972, their mission had been accomplished and the shop was sold, with proceeds used to establish a scholarship fund. From 1972 to 1988, many students benefited from this fund. In 1988, the Window Shop Scholarship Fund was terminated, and a portion of the endowment was given to Northeastern to create a new fund. Income from this fund is awarded annually to new Americans who are refugees and demonstrate financial need.

Robert W. Yesucevitz Memorial Scholarship *College of Criminal Justice* This scholarship fund was established in 1983 in memory of Robert W. Yesucevitz, a federal police officer employed by the United States Federal Protective Service. Officer Yesucevitz was killed in the line of duty while serving at the John F. Kennedy Presidential Library, and this memorial was created by his family and friends, including many police officers. The income from the fund is awarded annually to a freshman in the College of Criminal Justice who demonstrates academic promise and financial need.

Albert B. Young Scholarship *College of Pharmacy and Allied Health Professions* This fund was established in 1986 to commemorate the fiftieth birthday of Albert B. Young. Mr. Young is a 1960 graduate of the College of Pharmacy and a loyal supporter of the University. Knowing of his regard for Northeastern, his family and friends have given in his name to create an annual scholarship award for pharmacy students in their junior or senior year who demonstrate financial need, academic promise, and soundness of character.

Joseph P. Zabilski Athletic Scholarship Fund *All Basic Colleges* This fund was established by the Northeastern University Varsity Club in recognition of Joseph P. Zabilski's 35 years of service to Northeastern University. Mr. Zabilski served with high distinction as teacher, varsity athletic coach, and athletic director. His dedication, enthusiasm, and loyalty to the Northeastern student athlete provided a model for all to emulate. It is with great pride that the Varsity Club membership provides this award in his name.

Other Scholarships

The following scholarships are funded by outside sources. See the Financial Aid section, page 34, for more information.

Dr. Martin E. Adamo Award *College of Pharmacy and Allied Health Professions* This award of \$200 is given annually by the Boston Association of Retail Druggists in memory of Dr. Martin E. Adamo, the second president of the New England College of Pharmacy.

American Foundation for Pharmaceutical Education Scholarships *College of Pharmacy and Allied Health Professions* The Board of Grants of the American Foundation for Pharmaceutical Education provides \$600 to be drawn upon to aid qualified students in the upper three years who are in the upper quarter of their class and who maintain a B or higher grade average. It is understood that the students have received or are eligible to receive assistance in an amount at least equal to the grant provided by the foundation from other University sources in payment of required college expenses. The use of the grant is restricted to the payment of tuition or other required college fees. The recipients are identified as "Scholars of the American Foundation for Pharmaceutical Education."

Boston Association of Retail Druggists Romulus Dinicola Scholarship *College of Pharmacy and Allied Health Professions* This scholarship was established in 1984 to honor Romulus Dinicola and recognize his contributions to pharmacy upon his retirement from his long association with the Massachusetts State Board of Pharmacy. Preference is given to a student majoring in pharmacy who is entering his or her senior year. Selection is based on personal qualifications, need, and scholastic achievement. The initial award of \$200 was made in 1984.

Boston Society of Civil Engineers Scholarship in Memory of Desmond FitzGerald *College of Engineering—Civil Engineering* In 1931, the Boston Society of Civil Engineers established a scholarship in memory of Desmond FitzGerald, a former president of the Society and eminent hydraulic engineer with a distinguished record of service. It has been awarded annually since 1931 to an outstanding Northeastern University senior or junior student in the Department of Civil Engineering of the College of Engineering. The presentation is made by the president of the Boston Society of Civil Engineers at the Society's annual meeting in the spring.

Burroughs Wellcome Scholarship and Award Fund *College of Pharmacy and Allied Health Professions* This endowed fund was established by the Burroughs Wellcome Pharmacy Education Program to assist deserving pharmacy students in the completion of their education. Recipients are selected on the basis of need and academic promise.

William M. Cavanaugh Memorial Scholarship *All Colleges* This award, established by the members of the Publicity Club of Boston, is open to juniors and seniors who demonstrate talent in the field of communications. The \$100 scholarship bears the name of the second president of the Publicity Club (1950–1951), who was an able and successful newspaperman.

Civil Engineering Department Award *College of Engineering—Civil Engineering* The Civil Engineering Department Award was established by members of that department to recognize achievement and give financial assistance to a student majoring in civil engineering. This award, in the amount of \$100, is financed by gifts from members of the Civil Engineering Department and is awarded to the recipient at the beginning of the sophomore year.

Connecticut Alumni Rudolf O. Oburg Scholarships *All Colleges* Each year the Connecticut Alumni Club awards scholarships to students from Connecticut who have achieved a high academic average in their freshman year and have demonstrated financial need. The scholarships are to be used toward the tuition expense of the sophomore year. These scholarships were established in 1958 to promote Northeastern University among the preparatory schools of Connecticut and, in 1971, were named to honor Rudolf O. Oburg, the former director of alumni relations.

Consumer Value Stores Scholarships *College of Pharmacy and Allied Health Professions* Established in 1977, these two scholarship awards of \$750 are granted to fourth- or fifth-year pharmacy students. Recipients must demonstrate interest in community pharmacy, financial need, and involvement in student activities. Special consideration is given to students working for CVS who meet these criteria.

Jack Eckerd Corporation Scholarship *College of Pharmacy and Allied Health Professions* This \$1,000 award is given to a junior or senior student enrolled in the pharmacy curriculum. Preference is given to children of employees of the Jack Eckerd Corporation or to a person who has been employed or will be employed by the corporation.

Electrical Manufacturers Representatives Club of New England, Inc., Scholarship *Electrical Engineering* Established in 1958, this scholarship of \$475 is granted to a student or students majoring in electrical engineering, without regard to race, creed, or color. To qualify, students must have real financial need and excellent scholastic standing.

Frissora Family Scholarship Award *College of Engineering—Science Majors* This award was established by the Frissora family in 1972. Awards are made to first-year students on the basis of their high school scholastic record and financial need. Preference is given to students of Italian-American extraction who are pursuing an education in a technically oriented curriculum such as engineering, science, mathematics, pre-medicine, or nursing. Application for this scholarship award must be made through the Grand Lodge of Massachusetts, Order of Sons of Italy in America, 705 Cambridge Street, Boston,

Massachusetts 02141. Students selected receive a grant of \$300 per year for four years. Funds are paid directly to Northeastern University.

LaVerdiere's Super Drug Stores Scholarships *College of Pharmacy and Allied Health Professions* Established in 1976, these two \$500 awards are offered to students who have completed two or more full years in the pharmacy curriculum, who are graduates of either a Maine or a New Hampshire high school, and who are deserving of financial assistance.

McKesson & Robbins, Inc., Award *College of Pharmacy and Allied Health Professions* This plaque, given annually by McKesson & Robbins, Inc., is awarded to a pharmacy major. The award recipient is determined by the College of Pharmacy Scholarship Committee.

Massachusetts State Pharmaceutical Association Award *College of Pharmacy and Allied Health Professions* This scholarship of \$200, established by the Massachusetts State Pharmaceutical Association, is awarded annually. The recipient must be a resident of Massachusetts.

Medical Laboratory Science Alumni, Faculty, and Student Club Scholarships *College of Pharmacy and Allied Health Professions—Medical Laboratory Science* Each year, the Medical Laboratory Science Program awards these three \$100 or more scholarships to promising students in the Medical Laboratory Science undergraduate programs.

National Association of Chain Drug Stores (NACDS) Education Foundation Scholarship *Pharmacy* This scholarship was established in 1985 to support undergraduate pharmacy education and encourage talented students to pursue careers in community pharmacy practice. Preference is given to pharmacy students in the second or third professional year of study and those who have expressed interest in the community practice of pharmacy.

New England Paper Merchants, Inc., Scholarship *All Colleges* Established in 1959 by the New England Paper Merchants Association, Inc., this is an annual scholarship awarded to a junior or senior who has demonstrated by cooperative work achievement and extracurricular activities an interest and potential in the field of sales. The recipient must be of high character, be able to demonstrate financial need, and have a good academic record.

Norfolk County Pharmaceutical Association Scholarship *College of Pharmacy and Allied Health Professions* This scholarship of \$50 is awarded annually to a student who meets the requirements both financially and scholastically and is a resident of one of the member towns covered by the Norfolk County Pharmaceutical Association (Norwood, Dedham, Canton, Walpole, Millis, Needham, Westwood, and Islington, in Massachusetts).

Susan L. Orchard Memorial Fund *All Colleges* This fund, honoring the memory of Susan L. Orchard, was established in 1978 by her parents and other family members and friends. Susan's mother, Alberta Saletan, died several years later and the fund is now dedicated to her memory as well. Reflecting Susan's interest, as a student at Northeastern University, in improving the quality of life and opportunities for women, the annual income of this fund will be awarded to mothers pursuing their studies at Northeastern who require financial assistance in order for their children to make use of the University's Day Care Center. Recipients will be selected by the Center's director and Advisory Committee.

Charles I. Haley Phi Kappa Phi Scholarship *All Colleges* Established in 1982 by the University's Chapter of Phi Kappa Phi, the national interdisciplinary honor society, the scholarship is available to a student transferring from Roxbury Community College. The nomination is made by the president of Roxbury Community College in accordance with criteria established by the University's chapter.

Revco Foundation *College of Pharmacy and Allied Health Professions* Established in 1985, this \$500 donation to the College of Pharmacy Scholarship Fund is used to aid a pharmacy student deserving of financial assistance.

Rite Aid Corporation Scholarships *College of Pharmacy and Allied Health Professions* The purpose of this award, established in 1977, is to assist senior pharmacy students in completing their training in pharmacy. The students should demonstrate financial need, personal qualifications, and good academic records.

Ernest L. Spencer Scholarship Award *College of Engineering—Civil Engineering* Established in 1975 by the family and friends of Ernest L. Spencer as a memorial, this award is administered by Chi Epsilon, honor society for civil engineers. Professor Spencer, chairman of the Civil Engineering Department from 1963 until his death in 1975, was a member of the Northeastern University faculty for 36 years. At present, income from the endowment provides an annual award of \$500. Nominees are selected from the senior class of civil engineering students by the department scholarship committee. Criteria on which the award is based include high academic achievement, active participation in student affairs, and evidence of superior professional promise as demonstrated by high evaluations on cooperative work assignments.

Springfield Druggists' Association Scholarship *College of Pharmacy and Allied Health Professions* A scholarship of \$100 is offered by the Springfield Druggists' Association, to be awarded to a sophomore or junior who maintains the highest average in the Department of Pharmacy and who is worthy and in need of financial assistance. The Springfield Druggists' Association Scholarship Fund was established in 1956.

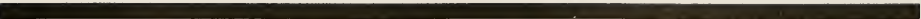
Lt. Col. and Mrs. Edward B. Wenners Scholarship Society of American Military Engineers *Civil Engineering* This scholarship was established in 1990 by Edward B. Wenners, Lt. Col. USA (Ret.), E '63, with the Society of American Military Engineers to provide an annual scholarship for a civil engineering middler, junior, or senior. The award is based on financial need; the student should be active in ROTC or demonstrate good citizenship in some other way. Students are nominated by the Civil Engineering Department.

Gifts and Bequests to Northeastern University

Northeastern University welcomes scholarships, gifts, and bequests to further its educational purposes. Those contemplating gifts or bequests are asked to confer with the Office of Development regarding the needs of the University.

Planned gifts to the University can often be combined with personal financial goals to produce maximum financial security as well as significant tax savings for an individual or family. A member of the Northeastern University development staff will be happy to consult with those considering a gift or bequest.

The legal name of the University is "Northeastern University." In making a gift or bequest, the following wording should be used: "Northeastern University, an educational institution incorporated under the laws of Massachusetts and located in Boston, Massachusetts."



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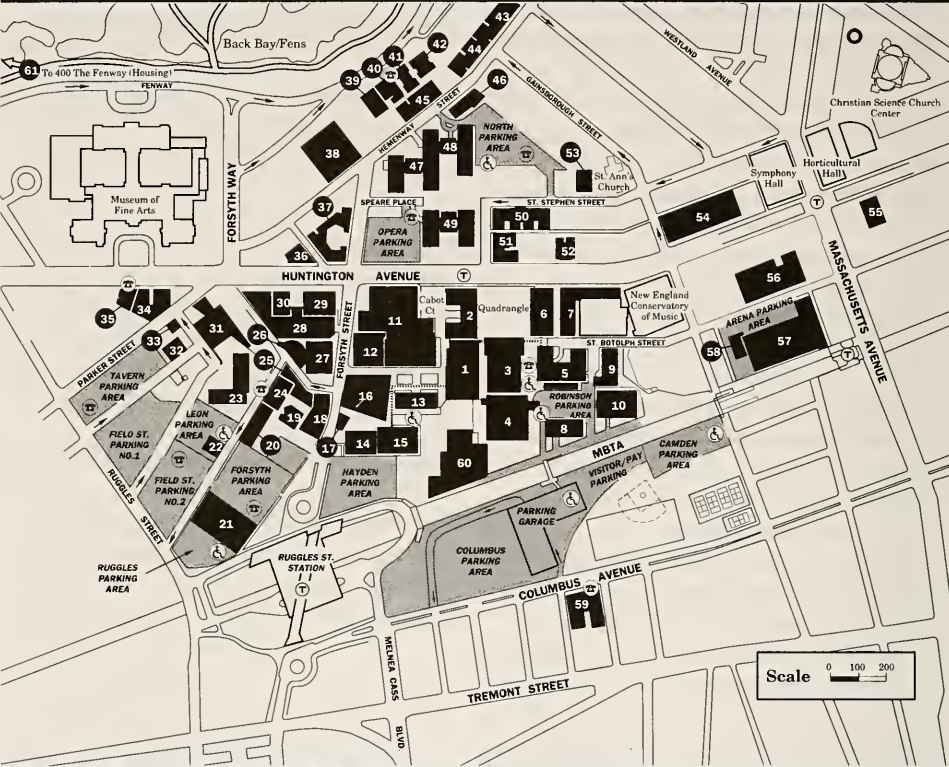
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University Map

N Northeastern University

Boston
Massachusetts **N** ↗



Key

Academic, residential,
and service buildings

Handicap parking

Accessible routes

Parking areas

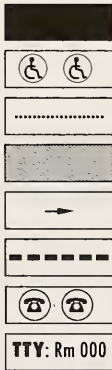
Street direction

Underground tunnel

Emergency telephone

TTY locations

See alphabetic list of buildings
for **TTY** locations.



Maps are provided by the Information Center, 115
Richards Hall, extension 2736 (TTY extension 3768).
Some buildings on this map are used but not owned
by Northeastern University. 6/91

Academic and Service Buildings

22	African-American Institute (AF)	7	316 Huntington Avenue
12	Borletta Natatorium (BN)		(Northeastern at the YMCA)
19	Boiler Plant	54	Huntington Plaza
11	Cabat Physical Education Building (CB) TTY: Rm 110		(271 Huntington Avenue) (HN)
39	Cahners Hall (CA) TTY: Rm 151	10	Hurtig Hall (HT)
28	Cargill Hall (CG)	26	Kariotis Hall (KA)
13	Churchill Hall (CH)	41	Kerr Hall (Faculty Center) (KH)
59	Columbus Place	29	Knowles Center (Gryzmish Hall) (KG)
	(716 Columbus Avenue) (CP)		(Volpe Hall) (KV)
56	Cotting School (CT)	25	Lake Hall (LA) TTY: Rm 203
9	Cullinane Hall (CN)	57	Matthews Arena (MA)
40	Cushing Hall (CU)	58	Matthews Arena Annex (MX)
14	Dana Research Center (DA)	20	Meserve Hall (ME) TTY: Rm 305
27	Dockser Hall (DK) TTY: Rm 107	5	Mugar Life Science Building
6	Dodge Building (DB)		(Peabody Health Professions Center) (MU)
3	Ell Student Building (Auditorium) (EL) TTY: Rms 04,104	18	Nightingale Hall (NI) TTY: Rm 125
4	Ell Student Center (Student Lounge) (EC) TTY: Rm 255	31	Parker Building (PA)
16	Forsyth Building (FR) TTY: Rms 100, 135	2	Richards Hall (RI) TTY: Rms 150, 254
17	Forsyth Building Annex (FA)	8	Robinson Hall (RB)
38	Forsyth Dental Building (FE)	21	Ryder Hall (RY) TTY: Rms 170, 180, 251, 270
1	Hayden Hall (HA) TTY: Rms 120, 202	15	Snell Engineering Center (SN) TTY: Rm 120
33	Hillel-Frager (HF)	60	Snell Library (SL) TTY: Reference Desk
24	Holmes Hall (HO) TTY: Rm 276	50	122 St. Stephen Street (SS)
55	236 Huntington Avenue (HU)	30	Stearns Center (ST) TTY: Rm 302
		32	26 Tavern Road (TA)

Residence Buildings

34	Burstein Hall	42	Melvin Hall
43	Kennedy Hall	35	Rubenstein Hall
46	142-148 Hemenway Street	44	Smith Hall
45	153/157-163 Hemenway Street	49	Speare Hall
7	316 Huntington Avenue	48	Stetson East TTY (public)
	(Northeastern at the YMCA)	47	Stetson West
52	319 Huntington Avenue	50	106/110/116/122 St. Stephen Street
51	337 Huntington Avenue	23	Willis Hall
36	407 Huntington Avenue	37	White Hall
41	Kerr Hall	61	400 The Fenway
53	Light Hall		

Northeastern University's Mission

Northeastern University's mission, as a large urban university founded on the cooperative model of education, is to provide individuals with the opportunity for upward mobility through excellence in education. The University achieves its mission through curricula that value equally knowledge for its own sake, knowledge as a means to success in the workplace, and knowledge as a cornerstone of personal achievement and satisfaction.

Achieving Northeastern University's mission requires excellence in teaching, and teaching remains the central activity of Northeastern's faculty. By offering undergraduate and graduate programs that are rigorous, relevant, and rewarding, the University provides a solid structure for educational excellence. Northeastern University is also committed to the search for knowledge through the scholarly and artistic undertakings of its faculty and students.

A central mandate of Northeastern University is to offer students the opportunity to apply directly lessons of the classroom and laboratory to the workplace through cooperative education. For three quarters of a century, cooperative education has been the keystone of Northeastern's uniqueness. As an increasing percentage of the nation's population enters the work force and new technologies continue to change the nature of work, the University has rededicated itself to helping the cooperative plan keep pace with those changes.

Northeastern University is committed to serving the educational needs of a diverse student population in an amenable physical environment. The University believes that its mission can be achieved only if the student body is not limited by economic status, cultural or racial background, geographic origin, sex, or age. Northeastern has a long history of serving the educational needs of the nontraditional student, providing degree and nondegree programs for people whose circumstances prevent them from following the standard college regimen.

Looking beyond the confines of the campus, Northeastern University is determined to maintain and strengthen its reputation as a friend to the City of Boston and a partner of the Commonwealth of Massachusetts. The University's obligation to serve the community of which it is an integral part is fulfilled primarily through the educational enterprise. Through its numerous outreach programs, the University has made striking contributions to the community in the applied social sciences, in high technology, and in the arts. Northeastern University will continue to contribute in these and other ways to the region's overall quality of life and to its economic vitality.

Accreditation Statement

Northeastern University is accredited by the New England Association of Schools and Colleges, Inc., a nongovernmental, nationally recognized organization whose affiliated institutions include elementary schools through collegiate institutions offering postgraduate instruction.

Accreditation of an institution by the New England Association indicates that it meets or exceeds criteria for the assessment of institutional quality periodically applied through a peer group review process. An accredited school or college is one which has available the necessary resources to achieve its stated purposes through appropriate educational programs, is substantially doing so, and gives reasonable evidence that it will continue to do so in the foreseeable future. Institutional integrity is also addressed through accreditation.

Accreditation by the New England Association is not partial but applies to the institution as a whole. As such, it is not a guarantee of the quality of every course or program offered, or the competence of individual graduates. Rather, it provides reasonable assurance about the quality of opportunities available to students who attend the institution.

Inquiries regarding the status of an institution's accreditation by the New England Association should be directed to the administrative staff of the school or college. Individuals may also contact the New England Association of Schools and Colleges, The Sanborn House, 15 High Street, Winchester, Massachusetts 01890, 617-729-6762.

Delivery of Services

The University assumes no liability, and hereby expressly negates the same, for failure to provide or delay in providing educational or related services or facilities or for any other failure or delay in performance arising out of or due to causes beyond the reasonable control of the University, which causes include, without limitation, power failure, fire, strikes by University employees or others, damage by the elements and acts of public authorities. The University will, however, exert reasonable efforts, when in its judgment it is appropriate to do so, to provide comparable or substantially equivalent services, facilities or performance, but its inability or failure to do so shall not subject it to liability.

The Northeastern University *Bulletin* contains current information regarding the University calendar, admissions, degree requirements, fees, and regulations, and such information is not intended to be and should not be relied upon as a statement of the University's contractual undertakings.

Northeastern University reserves the right in its sole judgment to promulgate and change rules and regulations and to make changes of any nature in its program, calendar, admissions policies, procedures and standards, degree requirements, fees, and academic schedule whenever it is deemed necessary or desirable, including, without limitation, changes in course content, the rescheduling of classes, canceling of scheduled classes and other academic activities and requiring or affording

alternatives for scheduled classes or other academic activities, in any such case giving such notice as is reasonably practicable under the circumstances.

Northeastern University will do its best to make available to you the finest education, the most stimulating atmosphere, and the most congenial conditions it can provide. But the quality and the rate of progress of your academic career is in large measure dependent upon your own abilities, commitment, and effort. This is equally true with respect to professional advancement upon completion of the degree or program in which you are enrolled. The University cannot guarantee that you will obtain or succeed at any particular job; that will depend upon your own skills, achievement, presentation, and other factors such as market conditions at that time. Similarly, in many professions and occupations there are increasing requirements imposed by federal and state statutes and regulatory agencies for certification or entry into a particular field. These may change during the period of time when you are at Northeastern and they may vary from state to state and from country to country. While the University stands ready to help you find out about these requirements and changes, it is your responsibility to initiate the inquiry because the University has no other way of knowing what your expectations and understandings are.

In brief, the University is there to offer you educational opportunities and choices and to assist you in finding the direction in which you want to steer your educational experience. But you are a partner in this venture with an obligation and responsibility to yourself.

Tuition and Regulations

Tuition rates, all fees, rules and regulations, courses, and course content are subject to revision by the President and the Board of Trustees at any time.

Disability Resource Center

The Disability Resource Center provides a variety of support services and general assistance to all of Northeastern's disabled students and employees.

Northeastern's efforts to comply with the Title IX Education Amendments of 1972 and Section 504 of The Rehabilitation Act of 1973 are coordinated by the Dean and Director of Affirmative Action.

Equal Opportunity Policy

Northeastern University does not discriminate on the basis of race, color, religion, sex, sexual preference, age, national origin, or veteran or handicapped status in admission to, access to, treatment in, or employment in its programs and activities. In addition, Northeastern University will not condone any form of sexual harassment. Handbooks containing the University's nondiscrimination policies and its grievance procedures are available in the Office of Affirmative Action, 175 Richards Hall. Inquiries regarding the University's nondiscrimination policies may be directed to Ellen S. Jackson, Dean/Director, Office of Affirmative Action, 175 Richards Hall, Northeastern University, Boston, Massachusetts 02115, 617-437-2133.

Inquiries concerning the application of nondiscrimination policies may also be referred to the Regional Director, Office for Civil Rights, United States Department of Education, J. W. McCormack Building, Post Office Court House, Room 222, Boston, Massachusetts 02109-4557.

Family Educational Rights and Privacy Act

In accordance with the Family Educational Rights and Privacy Act of 1974, Northeastern University permits its students to inspect their records wherever appropriate and to challenge specific parts of them when they feel it necessary to do so. Specific details of the law as it applies to Northeastern are printed in the *Student Handbook* and are distributed annually at the registrations of the University colleges and the graduate schools.

Emergency Closing of the University

Northeastern University has made arrangements to notify students, faculty, and staff by radio when it becomes necessary to cancel classes because of extremely inclement weather. AM radio stations WBZ (1030), WEEI (590), WHDH (850), WRKO (680), and FM stations WBCN (104.1), and WROR (98.5) are the stations authorized to announce the University's decision to close. Since instructional television courses originate from live or broadcast facilities at the University, neither the classes nor the courier service operates when the University is closed.

For more information, please write or telephone:

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